

**UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF TENNESSEE
AT KNOXVILLE**

EMERACHEM HOLDINGS, LLC,)
)
)
Plaintiff,) Case No. 3:14-cv-132
v.)
)
) Judge Atchley
VOLKSWAGEN GROUP OF AMERICA,)
INC., VOLKSWAGEN AG, and) Magistrate Judge Guyton
VOLKSWAGEN GROUP OF AMERICA
CHATTANOOGA OPERATIONS, LLC,)
)
Defendants.)

MEMORANDUM OPINION

Before the Court is the parties' request for claim construction pursuant to *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979 (Fed. Cir. 1995), *aff'd* 517 U.S. 370 (1996). Following a technology tutorial, the Court held a claims construction hearing on April 22, 2021, and took the matter under advisement.

I. BACKGROUND

This patent case concerns invalidity and infringement contentions related to two patents owned by Plaintiff EmeraChem Holdings, LLC ("EmeraChem"). First, U.S. Patent No. 5,599,758 ("the '758 Patent") discloses a process for regenerating a devitalized catalyst/absorber after exposure to pollutants in the combustion gases of engines. '758 Patent, col.1:5-9.¹ The '758 Patent incorporates U.S. Patent No. 5,451,558 ("the '558 Patent") in its entirety. *Id.* at col. 1:57-58. The '558 Patent relates to a process for reducing gaseous pollutants in the air which are produced by

¹ To allow for greater specificity, reference to the subject patents is made to the column and line number in which the quoted material appears. For all other documents in the record, citation is made to the CM/ECF stamped document and page number, rather than to the internal pagination or designation of any filed document. Where possible, the Court refers to more specific subdivisions within a document.

combustion of hydrocarbons or hydrogen in an engine or boiler, primarily in a gas turbine. '558 Patent, col. 1:9-15. The second patent at issue is U.S. Patent No. 7,951,346 ("the '346 Patent"), which discloses methods and systems for reducing emissions of particulate matter in a gaseous stream. '346 Patent, col. 1:43-46.

On March 31, 2014, EmeraChem filed this patent infringement action against Volkswagen Group of America, Inc. ("VGA"), Volkswagen AG, and Volkswagen Group of America Chattanooga Operations, LLC ("VGACO" and with VGA and Volkswagen AG, "Volkswagen"). The Amended Complaint [Doc. 40], asserts that Volkswagen infringed on five of EmeraChem's patents: U.S. Patent No. 5,451,558 (Count I), U.S. Patent No. 5,599,758 (Count II), U.S. Patent No. 5,953,911 (Count III), U.S. Patent 6,037,307 (Count IV), and U.S. Patent No. 7,951,346 (Count V). Defendants VGACO [Doc. 41], VGA [Doc. 42], and Volkswagen AG [Doc. 50] each filed an Answer. VGACO and VGA also asserted counterclaims of non-infringement and invalidity as to the '558 patent (Counts I & II), the '758 patent (Counts III & IV), the '911 patent (Counts V and VI), the '307 patent (Counts VII & VIII), and the '346 patent (Counts IX & X). [Doc. 41 at 17-20; Doc. 42 at 16-19].

On April 3, 2015, the parties asked the Court to stay the case pending resolution of *inter partes* review proceedings instituted by the Patent Trial and Appeal Board ("PTAB") on the petition of Volkswagen. [Doc. 55]. The Court granted the joint motion and stayed the case on April 10, 2015. [Doc. 57]. Almost four years later, on February 8, 2019, EmeraChem moved to lift the stay [Doc. 64], which Volkswagen opposed [Doc. 69]. After oral argument, former Chief Judge Reeves extended the stay for six months and referred the case to mediation. [Doc. 72].

On November 20, 2019, the parties filed a Notice of Voluntary Dismissal [Doc. 80], dismissing with prejudice EmeraChem's infringement claims relating to the '558 Patent (Count I),

the '911 Patent (Count III), and the '307 Patent (Count IV). [Doc. 80 at1]. The Notice also dismisses without prejudice VGA and VGACO's counterclaims relating to the '558 Patent (Counts I & II), the '911 Patent (Counts V & VI), and the '307 Patent (Counts VII & VIII).

Still before the Court are Plaintiff's infringement claims and Defendants' invalidity and non-infringement claims related to the '758 Patent and '346 Patent. [See Doc. 80 ("Plaintiff's Claims II and V and Defendant's Counterclaims III, IV, IX, and X shall not be affected by this notice.")].

Pursuant to the Scheduling Order [Doc. 90], the Volkswagen Defendants and EmeraChem each filed an opening claim construction brief, response to the opposing party's brief, and a reply. Volkswagen filed a Supplemental Citation of Recent Precedential Legal Authorities [Doc. 117], to which EmeraChem responded [Doc. 118]. Plaintiff then filed a Supplemental Brief [Doc. 120] and Volkswagen responded [Doc. 121].

II. CLAIM CONSTRUCTION PRINCIPLES

"[T]he claims of a patent define the invention to which the patentee is entitled the right to exclude." *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (*quoting Innova/Pure Water, Inc. v. Safari Water Filtration Sys., Inc.*, 381 F.3d 1111, 1115 (Fed. Cir. 2004)). The meaning of patent claims is a matter for the court and not the jury to decide. *Markman v. Westview Instruments, Inc.*, 517 U.S. 370 (1996). Thus, "[c]laim construction aims to define the proper scope of the invention and to give meaning to claim language when the jury might otherwise misunderstand a claim term in the context of the patent and its file history." Peter Menell, *et al.*, *Patent Case Management Judicial Guide*, § 5.1.4.3 (Fed. Jud. Ctr. 2016).

Claim construction requires the Court to determine "the meaning of claim terms from the perspective of the person of ordinary skill in the art." *Immunex Corp. v. Sanofi-Aventis U.S., LLC*,

977 F.3d 1212, 1221 (Fed. Cir. 2020). “The words of a claim ‘are generally given their ordinary and customary meaning.’” *Phillips*, 415 F.3d at 1312 (*quoting Vitronics Corp. v. Conceptronic*, 90 F.3d 1576, 1582 (Fed. Cir. 1996)). The “ordinary and customary meaning” of a claim term is the meaning the term would have to a person of ordinary skill in the art at the time of the invention. *Id.* at 1313. A person of ordinary skill in the art is presumed to read the claim term “not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification.” *Id.* at 1313. Thus, the Court must “first look to, and primarily rely on, the intrinsic evidence, including the claims themselves, the specification, and the prosecution history of the patent, which is usually dispositive.” *Id.* at 1218 (Fed. Cir. 2020) (*quoting Personalized Media Commc’ns, LLC v. Apple Inc.*, 952 F.3d 1336, 1340 (Fed. Cir. 2020)); *Phillips*, 415 F.3d at 1317. “[T]he specification is key—it is ‘highly relevant to the claim construction analysis’ and the ‘single best guide to the meaning of a disputed term.’” *Immunex Corp.*, 977 F.3d at 1218 (*quoting Phillips*, 415 F.3d at 1315). The specification includes the written description of the invention and the manner and process of making and using it, as well as the preferred embodiment – “the best mode contemplated by the inventor or joint inventor of carrying out the invention.” 35 U.S.C.A. § 112(a). Expert and inventor testimony, dictionaries, and learned treatises all comprise extrinsic evidence. *Id.* Such evidence “may be necessary to inform the court about the language in which the patent is written. But this evidence is not for the purpose of clarifying ambiguity in claim terminology.” *Markman*, 52 F.3d at 986.

It is “improper,” however, to “read limitations from a preferred embodiment described in the specification—even if it is the only embodiment—into claims absent a clear indication in the intrinsic record that the patentee intended the claims to be so limited.” *Liebel-Flarsheim Co. v. Medrad, Inc.*, 358 F.3d 898, 913 (Fed. Cir. 2004). And not all terms require construction. “Claim

construction is a matter of resolution of disputed meanings and technical scope, to clarify and when necessary to explain what the patentee covered by the claims, for use in the determination of infringement. It is not an obligatory exercise in redundancy.” *U.S. Surgical Corp. v. Ethicon, Inc.*, 103 F.3d 1554, 1568 (Fed. Cir. 1997). Thus, “[i]f a claim is nontechnical, is in plain English, and derives no special meaning from the patent and its prosecution history, then the court need not function as a thesaurus.” Peter Menell, *et al.*, *Patent Case Management Judicial Guide*, § 5.1.4.3 (Fed. Jud. Ctr. 2016).

III. THE '758 PATENT

The '758 Patent discloses a process for the regeneration of a devitalized catalyst/absorber after extended exposure to pollutants in the combustion gases of engines. '758 Patent, col. 1:6-9. The '558 Patent is incorporated into patent '758 in its entirety. '758, Patent col. 1:7-8. EmeraChem asserts claims 3 and 16 of the '758 Patent against Volkswagen. [Doc. 100 at 9]. Claim 3 depends from and includes all of the limitations of independent claim 1. [*Id.*]. Claim 16 depends from and includes all of the limitations of independent claim 13. [*Id.*].

The relevant claims of the '758 Patent are set forth in their entirety below.

1. A method of regenerating a devitalized absorber having nitrogen oxides absorbed therein or thereon, said method comprising the steps of: providing a stream of regenerating gas comprising a reducing gas, said reducing gas having an effective amount for removing said nitrogen oxides from said devitalized absorber, and an inert carrier gas; and passing said stream of regenerating gas comprising an inert carrier gas and a component selected from the group consisting of hydrogen, carbon monoxide and mixtures thereof over said devitalized absorber comprising an alumina support with a platinum coating thereon and having nitrogen oxides absorbed therein or thereon for an effective time, at an effective temperature and at an effective space velocity to remove said nitrogen oxides from said devitalized absorber to form a regenerated absorber.

...

3. The method of claim 1 wherein said regenerating gas further comprises up to 10% carbon dioxide.

...

13. A method of regenerating a devitalized catalyst/absorber and having nitrogen oxides absorbed therein or thereon, comprising the steps of: providing a stream of inert carrier gas containing an effectuating amount of a reducing agent selected from carbon monoxide, hydrogen gas and mixtures thereof said stream further characterized as containing at least carbon monoxide or carbon dioxide for removing said nitrogen oxides from said catalyst/absorber and restoring a carbonate form for said alkali or alkaline earth; passing said gaseous stream over said exhausted catalyst/absorber comprising an oxidation catalyst specie selected from platinum, palladium, rhodium, cobalt, nickel, iron, copper, molybdenum or combinations thereof disposed on a high surface area support, said catalytic component being intimately and entirely coated with an absorber material selected from a hydroxide, carbonate, bicarbonate or mixture thereof of an alkali or alkaline earth or mixtures thereof and having nitrogen oxides absorbed therein or thereon for an effective time, at a temperature in the range of 250° to 750° F. and at a GHSV in the range of 10 to 100,000 hr.-1 to remove said nitrogen oxides from said devitalized catalyst/absorber to form a regenerated catalyst/absorber.

...

14. The method of claim 13 wherein said inert carrier gas comprises nitrogen, steam, or mixtures thereof.

...

16. The method of claim 14 wherein said inert carrier gas comprises steam.

'758 Patent, col. 9:28-43, 47-48; col. 10:12-38, 44-45. The parties requested construction of numerous terms. The claim groupings herein are drawn from the parties' briefing.

A. Claim Grouping 1: "devitalized absorber"

Term	Claims	EmeraChem	Volkswagen
"a devitalized absorber"	Claim 1	Absorber that is saturated or partially saturated with absorbed or adsorbed nitrogen oxides	An absorber that can no longer absorb any nitrogen oxides therein or thereon.
"a devitalized catalyst/absorber"	Claim 13	A catalyst and absorber with the absorber saturated or partially saturated with absorbed or adsorbed nitrogen oxides.	A catalyst/absorber that can no longer absorb any nitrogen oxides therein or thereon.
"exhausted catalyst/absorber"	Claim 13	Synonymous with devitalized catalyst/absorber - a catalyst	The catalyst/absorber already has the maximum

		and absorber with the absorber saturated or partially saturated with absorbed or adsorbed nitrogen oxides.	amount of nitrogen oxides absorbed therein or thereon, and cannot absorb any more.
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Volkswagen argues that a “devitalized” absorber or catalyst is one that can no longer absorb any nitrogen oxides, and an “exhausted” catalyst/absorber is one that (i) has absorbed the maximum amount of nitrogen oxides possible, and (ii) cannot absorb any more nitrogen oxides.² EmeraChem maintains that “devitalized,” which appears in claims 1 and 13, is synonymous with “exhausted,” which appears only in claim 13. EmeraChem argues that an exhausted or devitalized catalyst/absorber can be either saturated or partially saturated with nitrogen oxides before it is regenerated. Volkswagen’s construction reads modifiers into the claim that are not supported by the specification and would exclude examples in the patent, while EmeraChem’s construction is overly broad. Upon consideration of the parties’ arguments, the Court will adopt its own construction.

First, the specification supports EmeraChem’s contention that the word “exhausted” in claim 13 is synonymous with the word “devitalized” in claim 1 and claim 13. Claim 13 describes passing a gaseous stream “over *said* exhausted catalyst/absorber.” ’758 Patent, col. 10:23-25. The word “said” calls back to the only other catalyst/absorber in claim 13, which is “a devitalized catalyst/absorber” in the preamble. ’758 Patent, col. 10:13. “Exhausted” is not used elsewhere in the specification or claims of the ’758 Patent. Since the word “said” must have an antecedent basis, “*said exhausted catalyst/absorber*” must call back to “*a devitalized catalyst/absorber*.³ See *Eastman Chem. Co. v. Basf Aktiengesellschaft*, 47 Fed. Appx. 566, 573-74 (Fed. Cir. 2002) (“BASF’s strongest argument to the contrary is that as a result of this construction, the neutral

² While Volkswagen does not distinguish between these two constructions, they are, at least theoretically, distinct. A catalyst/absorber might not be capable of absorbing more nitrogen oxides due to certain environmental factors, but that does not mean the amount absorbed is the maximum amount the catalyst/absorber can hold.

compound formed in step (a) is meaningless. However, no other construction of the term ‘the salt’ is feasible given that the word ‘the’ must have an antecedent basis); *Process Control Corp. v. HydReclaim Corp.*, 190 F.3d 1350, 1356-57 (Fed. Cir. 1999) (noting importance of an antecedent basis in claim construction).

The word “exhausted” is, however, used in the ’558 specification: “After the catalyst/absorber is exhausted or saturated it can be regenerated.” Patent ’558, col. 5:61-62. Volkswagen argues this language, incorporated by reference into the ’758 Patent, equates “exhausted” with “saturated.” [Doc. 98 at 16]. But the word “or” can connect both synonyms and alternatives. And the ’558 specification does not say “fully exhausted” or “fully saturated,” so Volkswagen’s argument begs the question. A person of skill in the art would not read the “exhausted or saturated” language in the ’558 specification to require full or maximum devitalization or exhaustion in claim 13.

Second, the intrinsic evidence does not support Volkswagen’s contention that the catalyst/absorber must be fully devitalized/exhausted before it is regenerated. The ’758 Patent discusses the catalyst/absorber of the ’558 patent:

When the catalyst/absorber ceases to be effective, and specifically, when the level of pollutants emanating from the apparatus after contact with the catalyst/absorber increases beyond an acceptable level, the absorber can be replaced, and the used absorber should then be recharged to an effective status again. One method of regenerating the catalyst is to remove the **spent (saturated or partially saturated)** carbonate from the catalyst/absorber . . .

Patent ’758, col. 2:16-23 (emphasis added). The ’758 specification goes on to suggest that a system for regenerating the absorber rather than removing it would be desirable. *Id.* at col. 2:31-35. In the ’558 Patent, the Summary of Invention explains that “[t]he absorber, when it ceases to be effective . . . can be replaced, and the used absorber can be recharged to an effective status again.” ’558 Patent, col. 3:23-28. Recharging of the catalyst is then accomplished by removing “the spent

(saturated or partially saturated) carbonate.”³ [Id. at 28-31]. According to EmeraChem, examples in the ’758 patent similarly show the regeneration process beginning when the absorber was still removing 90% or more of the NO_x. ’758 Patent, col. 4: 33-35; [Doc. 100 at 16].

The Court agrees that “full” exhaustion or devitalization is not required by claims 1 and 13. A person of skill in the art would read claims 1 and 13 in light of the specification as a whole, including the incorporated ’558 Patent. Both the ’758 and ’558 specifications show that a catalyst/absorber can be regenerated when it is not filtering *enough* pollutants, not just when it has absorbed the maximum number of nitrogen oxides or can absorb no more. As EmeraChem argues, the ’758 patent “specifically teaches” that regeneration may be performed on an absorber before it reaches maximum capacity. [Doc. 100 at 15]. This intrinsic evidence is not relied on to import limitations into the claims. To the contrary, the Court relies on the intrinsic evidence to show why Volkswagen’s effort to limit claims 1 and 13 is unsupported.

Moving to EmeraChem’s proposed construction, Volkswagen argues the “saturated or partially saturated” construction would render the ’758 Patent impermissibly indefinite. “A claim is indefinite if its legal scope is not clear enough that a person of ordinary skill in the art could determine whether a particular composition infringes or not.” *Geneva Pharms., Inc. v. GlaxoSmithKline PLC*, 349 F.3d 1373, 1384 (Fed. Cir. 2003); *Nautilus, Inc. v. Biosig Instrs., Inc.*, 572 U.S. 898, 901 (2014) (a patent is invalid for indefiniteness if its claims, read in light of the specification and prosecution history, “fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention.”).⁴

³ For the same reason, EmeraChem’s use of the word “spent” in the IPR proceedings does not suggest that it advocated for a “fully saturated” construction. [See Doc. 105 at 22; Doc. 98-1 at 150-151].

⁴ EmeraChem notes that other courts have found that the term “partially” does not render a claim indefinite. [Doc. 112 at 20]. Volkswagen distinguishes these cases because in each case, the term “partially” appeared in the text of the patent, not a proposed construction. But Volkswagen’s indefiniteness argument is not based on the text of the patent either, it is based on EmeraChem’s proposed construction.

But the United States Court of Appeals for the Federal Circuit has explained “that relative terms such as ‘substantially’ do not render patent claims so unclear as to prevent a person of skill in the art from ascertaining the scope of the claim.” *Tinnus Enters., LLC v. Telebrands Corp.*, 733 F. App’x 1011, 1018 (Fed. Cir. 2018) (quoting *Deere & Co. v. Bush Hog, LLC*, 703 F.3d 1349, 1359 (Fed. Cir. 2012)). Here, the ’758 Patent indicates that regeneration can occur “[w]hen the catalyst/absorber ceases to be effective.” ’758 Patent, col. 2:16-19. It also provides examples, which a person of skill in the art could rely on in making and using the invention. Volkswagen does not acknowledge the examples in the ’758 Patent or respond to the contention that some would be excluded by its construction.

While not impermissibly indefinite, EmeraChem’s construction would mean that a catalyst/absorber could be devitalized or exhausted at almost any degree of saturation. The ’758 specification indicates that the term is not so broad: “In the present invention, a devitalized catalyst/absorber is regenerated . . . to restore the initial activity or to otherwise substantially improve the activity.” ’758 Patent, col. 2:48-50. A devitalized catalyst/absorber, then, is one that is either capable of restoration to initial activity or capable of substantially improved activity. Similarly, the specification expresses the advantages of a system for regenerating an absorber “[w]hen it ceases to be effective” before introducing the present invention. *Id.* at col. 2:17, 46. The language and examples of the patent indicate that (i) whether a catalyst/absorber is exhausted or devitalized is based on the effectiveness of the catalyst/absorber, not directly on the amount of nitrogen oxides absorbed therein or thereon; and (ii) a devitalized catalyst/absorber is one that is more than negligibly saturated with nitrogen oxides, as it must be capable of improved activity.

A person of ordinary skill in the art would find the “exhausted” or “devitalized” catalyst/absorber term to mean a catalyst/absorber that is saturated or partially saturated with

nitrogen oxides, such that removal of said nitrogen oxides substantially improves the activity of the absorber or restores the initial activity of the absorber. The claim does not require full saturation. This construction is consistent with the examples provided in the '758 Patent, the incorporated '558 Patent, and the summary and description of the invention itself. *See Budde v. Harley-Davidson, Inc.*, 250 F.3d 1369, 1379-80 (Fed. Cir. 2001) (“It is necessary to consider the specification as a whole, and to read all portions of the written description, if possible, in a manner that renders the patent internally consistent.”).

Because the intrinsic evidence resolves the construction, the Court need not turn to extrinsic evidence. Volkswagen initially argued that Plaintiff’s statements to the European Patent Office constitute intrinsic evidence, but Plaintiff cited legal authority to the contrary. [Doc. 112 at 19]; *see Recticel Automobilesysteme GmbH v. Automotive Components Holdings, LLC*, 2012 WL 1276003, *9 (E.D. Mich. April 16, 2012) (statement made to European Patent Office regarding separate patent treated as extrinsic evidence). Volkswagen did not respond to this authority. Even were the Court inclined to consider this evidence, it is not particularly strong.

B. Claim Grouping 2: “an alumina support with a platinum coating thereon”

Term	Claims	EmeraChem	Volkswagen
“an alumina support with a platinum coating thereon”	Claim 1	An alumina support with platinum disposed over its surfaces. For example, a platinum solution may be applied to the alumina support and then heated, resulting in platinum disposed over the surfaces of the alumina support.	An alumina support entirely covered by at least a continuous monolayer of platinum.

The parties’ disagreement over this term centers on whether the “platinum coating” disclosed in claim 1 means a continuous monolayer of platinum on an alumina support or merely platinum “disposed over” an alumina support. EmeraChem points to the portion of the '758 Patent

in which it discusses incorporated patent '558 as describing a catalyst specie such as platinum “disposed on a high surface area support.” [Doc. 100 at 17]; '758 Patent, col. 1:57-63. EmeraChem also offers the declaration of Dr. Calvin Bartholomew explaining that the “platinum coating” disclosed in claim 1 would not form a continuous layer on the support. [Doc. 100 at 19; Doc. 100-2 at ¶ 27]. Based on this and other extrinsic evidence, EmeraChem argues that Volkswagen’s “continuous monolayer” construction would remove a preferred embodiment of the patent. [*Id.*].

Volkswagen argues that the Patent Trial and Appeal Board has already construed the platinum coating term and EmeraChem is estopped from proposing a contrary construction. Volkswagen argues: (i) issue preclusion bars EmeraChem from seeking another construction from this Court, (ii) the Board’s construction is at minimum persuasive, and (iii) EmeraChem disclaimed the construction it now seeks from the Court in the *inter partes* review proceeding. [*Id.* at 7]. Volkswagen does not ask the Court to construe the term precisely as the Board did, but rather argues that its current proposed construction “tracks the Board’s controlling construction.” [Doc. 98 at 11]. Volkswagen also urges the Court to disregard the extrinsic evidence proffered by EmeraChem, especially the declaration of Dr. Calvin Bartholomew. [*Id.*].

Because the construction of the “platinum coating” term was not actually litigated in the IPR and was not necessary to its outcome, collateral estoppel does not apply. Though the Board’s reasoning may still be considered, the Court does not find it persuasive. Further, the record does not support Volkswagen’s contention that EmeraChem disclaimed the construction it now seeks in the IPR. Based on the language in the '758 specification and incorporated '558 patent, the Court construes the “platinum coating thereon” term to mean an alumina support with platinum disposed on its surfaces. To the extent there is any ambiguity in the intrinsic evidence, the Court relies in

the alternative on the uncontested expert testimony that an “alumina support with platinum coating thereon” does not require a continuous monolayer of platinum.

Two issues were briefed by the parties that require only brief mention here. First, Volkswagen accuses EmeraChem of “seek[ing] to mislead this Court” by relying on cases in which the court found no estoppel because PTAB had applied the “broadest reasonable interpretation” standard applicable in certain IPR proceedings, rather than the principles set forth in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005), governing claim construction in a district court. [Doc. 111 at 9]. Plaintiff concedes that the ’758 Patent expired before the IPR was instituted, so the Board applied the principles announced in *Phillips* and applicable here. [See Doc. 112 at 9]. Second, EmeraChem’s responsive *Markman* brief [Doc. 112] argues that judicial estoppel does not apply because judicial estoppel only binds a party to a position it advocated and successfully achieved. [Doc. 106 at 7]. But Volkswagen raised collateral estoppel, not judicial estoppel. Accordingly, the Court has not addressed the applicability of judicial estoppel or whether its elements are met here.⁵

1. Collateral Estoppel Does Not Bar Litigation of the Platinum Coating Term

a. Application of Collateral Estoppel Doctrine to IPR Proceedings

When the ordinary elements of issue preclusion are met, “[i]t is well established” that the doctrine “applies in the administrative context.” *MaxLinear, Inc. v. CF CRESPE LLC*, 880 F.3d 1373, 1376 (Fed. Cir. 2018); *see B&B Hardware, Inc. v. Hargis Inds., Inc.*, 135 S. Ct. 1293, 1299-1300 (2015). As the Supreme Court of the United States has explained, the general rule is:

When an issue of fact or law is actually litigated and determined by a valid and final judgment, and the determination is essential to the judgment, the determination is

⁵ Because judicial estoppel is not asserted and because the broadest reasonable interpretation standard does not apply here, the Federal Circuit’s decision in *SkyHawke Techs., LLC, v. Deca Int’l Corp.*, 828 F.3d 1373, 1376 (Fed. Cir. 2016), is not, as Plaintiff contends, “directly on point to this case,” [Doc. 106 at 7], though some related principles apply.

conclusive in a subsequent action between the parties, whether on the same or a different claim.

B&B Hardware, 135 S. Ct. at 1303 (*quoting* Restatement (Second) of Judgments § 27, p. 250 (1980)). The Restatement lists several “well-known exceptions” including, *inter alia*, when the party against whom preclusion is sought could not have obtained review of the judgment or had a heavier burden in the initial action. Restatement (Second) of Judgments § 28 at 273. Issue preclusion can apply in a district court case where the earlier “action” was an *inter partes* review proceeding. *Papst Licensing GmbH & Co. KG v. Samsung Elecs. Am., Inc.*, 924 F.3d 1243, 1250-51 (Fed. Cir. 2019); *SynQor, Inc. v. Vicor Corp.*, 988 F.3d 1341, 1346-47 (Fed. Cir. 2021) (extending issue preclusion to *inter partes* reexamination). But the precise procedural context matters. *See e.g., SkyHawke Techs., LLC v. Deca Int'l Corp.*, 828 F.3d 1373, 1376 (Fed. Cir. 2016) (explaining that “issue preclusion does not require the Patent Office to use the claim construction determined by a district court” because the Patent Office is not a party to the district court proceeding); *Cisco Sys., Inc. v. Capella Photonics, Inc.*, 2020 WL 4923697, *5 (N.D. Cal. Aug. 21, 2020) (“[C]ourts . . . have made clear that the lack of preclusive effect in the claim construction context does not undermine claim collateral estoppel of an invalidity decision.”).

b. *Inter Partes* Review Proceedings

In September 2014, Volkswagen Group of America, Inc., petitioned for *inter partes* review of claims 1-14 and claims 16-20 of the ’758 patent on four grounds. [Doc. 98-1 at 50, 53]. As to Grounds 1-3, Volkswagen argued various claims were anticipated by U.S. Patent No. 5,406,790 (“Hirota”), European Patent App. Publ. No. 560,991 (“Takeshima”), and Saito Japanese Patent App. No. 62-106826 (“Saito”). [Doc. 111 at 12]. For Ground 4, Volkswagen argued claims 1-14 and 16-20 would have been obvious under 35 U.S.C. § 103(a) based on (1) the ’558 Patent (sometimes herein “Campbell”), (2) Hirota or Saito, and (3) U.S. Patent No. 5,362,463 (“Stiles”).

[*Id.*; Doc. 98-1 at 74].⁶ Only Grounds 2 and 4 are relevant here.

To establish anticipation, a party must show that each element of the claim in issue is found, either expressly or inherently, in a single prior art reference. *Finisar Corp. v. DirecTV Group, Inc.*, 523 F.3d 1323, 1334 (Fed. Cir. 2008). Volkswagen argued that Takeshima anticipates independent claim 1 of '758, which discloses “an alumina support with platinum coating thereon.” [Doc. 98-1 at 58]. [*Id.*]. Takeshima describes “alumina as a carrier” on which a substance such as platinum “is carried.” [Doc. 98-2 at 176 (Takeshima, col. 5: 1-9)].

The Board found that the platinum “carried on an alumina support” in Takeshima could be either (1) coated in a continuous form or (2) disposed in a non-continuous form. [Doc. 98-1 at 67]. “Since the record does not establish which of possibilities (1) or (2) is described by Takeshima, we find that Takeshima cannot anticipate.” [*Id.*]. The Board held that Volkswagen failed to prove by a preponderance of the evidence that Takeshima describes an alumina support with a platinum coating thereon, as recited in the '758 patent. [*Id.*].

Moving to Ground 4, the Board found that claims 1-14 and 16-20 would have been obvious under 35 U.S.C. § 103(a) over a combination of Campbell, Stiles, Hirota, and Saito. [Doc. 98-1 at 74]. The Board examined the regeneration methods described in these patents. It found that Campbell '558 differs from claim 1 of the '758 Patent because Campbell does not describe *in situ* regeneration; it is, however, a well-known technique described by Saito and Stiles. [*Id.* at 74, 90]. The Board found that a person skilled in the art would have appreciated that the regeneration technique described by Saito and Stiles “would have been equally applicable for regenerating in the Campbell environment.” [Doc. 98-1 at 91]. Accordingly, the Board found that based on Ground

⁶ Volkswagen describes PTAB as holding that claim 1 was invalid under § 103 over the combination of Campbell '558 and Saito. [Doc. 98 at 11]. The Sixth Circuit described the Board as finding claim 1 obvious over Campbell '558, Saito, and Stiles. *EmeraChem*, 859 F.3d at 1343. The precise combination of prior art under which claim 1 was obvious is not relevant here.

4 (obviousness), Volkswagen had established by a preponderance of the evidence that claims 1-14 and 16-20 of the '758 patent were unpatentable under 35 U.S.C. § 103(a). [*Id.* at 103].

EmeraChem appealed to the Federal Circuit. With respect to claims 1-2, 4-14, and 17-19, EmeraChem raised only one challenge to the Board's determination: whether Campbell '558 is § 102(e) prior art. *See EmeraChem Holdings, LLC v. Volkswagen Group of Am., Inc.*, 859 F.3d 1341, 1348 (Fed. Cir. 2017). The Federal Circuit found PTAB did not err in holding Campbell was prior art. Because EmeraChem did not challenge the disposition of these claims on any other grounds, it affirmed the Board's decision that these claims were unpatentable. *Id.*⁷

c. Collateral Estoppel Analysis

After careful consideration, the Court finds that the ordinary elements of collateral estoppel are not met here. The criteria for issue preclusion are not unique to patent law, so the United States Court of Appeals for the Sixth Circuit standard applies. *See Aspex Eyewear, Inc. v. Zenni Optical Inc.*, 713 F.3d 1377, 1380 (Fed. Cir. 2013). In the Sixth Circuit, four requirements must be met for collateral estoppel/issue preclusion to apply:

- (1) the precise issue must have been raised and actually litigated in the prior proceedings; (2) the determination of the issue must have been necessary to the outcome of the prior proceedings; (3) the prior proceedings must have resulted in a final judgment on the merits; and (4) the party against whom estoppel is sought must have had a full and fair opportunity to litigate the issue in the prior proceeding.

⁷ As to claims 3, 16, and 20, EmeraChem argued that the Board violated the Administrative Procedures Act because EmeraChem did not have notice of or an opportunity to respond to the Board's reliance on Stiles. *Id.* at 1348. After examining the petition, Volkswagen's claims chart, and the Institution Decision, the Federal Circuit agreed: "T]he Board denied EmeraChem its procedural rights guaranteed by the APA by relying on Stiles for its disclosure of limitations in dependent claims 3, 16, and 20." *Id.* The court vacated and remanded the Board's decision as to claims 3, 16, and 20, which are not at issue here. *Id.* at 1352.

Georgia-Pacific Consumer Prods. LP v. Four-U Packaging, Inc., 701 F.3d 1093, 1098 (6th Cir. 2012) (*quoting Cobbins v. Tenn. Dep’t of Transp.*, 566 F.3d 582, 589-90 (6th Cir. 2009)). The party seeking to invoke collateral estoppel bears the burden of proving each element is met. *Avocent Redmond Corp. v. U.S.*, 85 Fed. Cl. 640, 643 (U.S. Fed. Claims 2009). Volkswagen has not carried this burden because it has not demonstrated that the precise issue was raised and actually litigated in the prior proceedings or that the determination of the issue was necessary to the outcome of the prior proceedings.

i. Precise Issue Raised and Actually Litigated

Though the construction of the platinum coating term was decided by the Board, the “precise issue” was not “raised and actually litigated.” Neither party argued that a “platinum coating” is one that “intimately and entirely” coats the alumina support, so the term was not actually litigated between the parties. In fact, Volkswagen agreed that the ’758 Patent “teaches away from a monolayer of platinum covering the entirety of the alumina support.” [Doc. 100-8 at 16]. And while Volkswagen now argues that “both parties extensively argued their proposed constructions for this term,” the IPR briefing in the record suggests otherwise. In its reply brief, Volkswagen stated: “While Patent Owner’s Response seems to be predicated on a specific meaning of the ‘coating’ claim term . . . Patent Owner has failed to expressly state that specific meaning *or formally present a proposed construction of that term.*” [Doc. 100-8 at 15] (emphasis added). Similarly, Volkswagen included a “claim construction” section in its reply brief, which makes no mention of the “platinum coating” term. [Doc. 108-8 at 8-10]. Volkswagen’s expert apparently did not address the term in his declaration. [Doc. 98-1 at 62]. Instead, Volkswagen relied on Dr. Crocker’s testimony that a coating “would not imply that the platinum forms a

continuous monolayer.” [Doc. 100-8 at 16].⁸ With nearly two thousand pages of exhibits at its disposal, the only part of the record that Volkswagen offers to show that the parties “actually litigated” this issue is the Final Written Decision of the Board. [Doc. 105 at 9; Doc. 111 at 9].

Certainly the Board, like the Court, was free to adopt its own claim construction. But “[c]laim terms . . . are construed to resolve a ‘controversy, and only to the extent necessary to resolve the controversy.’” *EmeraChem Holdings, LLC v. Volkswagen Grp. of Am., Inc.*, 714 F. App’x 995, 996-97 (Fed. Cir. 2017) (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)). Here, the record indicates that neither party raised the issue, either by requesting or proposing a claim construction. Instead, both parties apparently agreed that a “platinum coating” did not mean a continuous monolayer of platinum on an alumina support. Thus, the construction did not go through the normal adversarial process before becoming part of the Board’s final decision. Under these circumstances, EmeraChem is not re-raising stale arguments against which Volkswagen has already been asked to defend. Volkswagen has not demonstrated that the proper construction of the “alumina support with a platinum coating thereon” term was actually raised and litigated in the IPR.

ii. Determination Necessary to Outcome

Volkswagen has also failed to show that the Board’s construction of the “platinum coating” term was necessary to the outcome of the IPR. First, the construction was not necessary to the Board’s determination that Takeshima could not anticipate claim 1. The finding of no anticipation turned on Takeshima, not the claim construction. Because the record did not establish whether Takeshima described platinum coated in continuous form or disposed in a non-continuous form, Takeshima could not anticipate. [Doc. 98-1 at 67]. Whether the Board construed “platinum

⁸ Though Dr. Crocker was Plaintiff’s expert in the IPR, both parties frequently cite to his testimony. Where specifically cited by the parties, the Court has considered Dr. Crocker’s testimony to the extent it is relevant.

coating” to require a continuous or non-continuous layer, the outcome of the Takeshima anticipation analysis would have been the same.

Next, the construction was not necessary to the Board’s determination that claim 1 was unpatentable for obviousness over a combination of Campbell, Stiles, and/or Saito. The Board did not discuss the construction or the claim term in connection with its obviousness determination. Volkswagen nonetheless argues that the construction was implicit in the obviousness determination as a matter of law.

Under § 103, a patent may not issue “if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.” 35 U.S.C. § 103. As Volkswagen notes, some courts have explained that “[t]o demonstrate obviousness based on a combination of prior art references, the party challenging a patent must show that all the elements of the claims were disclosed in the prior art and that a POSA would have had motivation or reason to combine the disclosures of the prior art references.” *Think Products, Inc. v. ACCO Brands Corp.*, 419 F. Supp. 3d 1078, 1082 (N.D. Ill. 2019)). And the Federal Circuit has certainly stated that prior to considering other aspects of the obviousness analysis, the court should consider whether the claimant carried its burden to prove that “all claimed limitations are disclosed in the prior art.” *PAR Pharm, Inc. v. TWI Pharm., Inc.*, 773 F.3d 1186, 1194 (Fed. Cir. 2014); *see also Medicem, S.A. v. Rolabo, S.L.*, 437 F.3d 1157, 1164 (Fed. Cir. 2006) (reciting obviousness standard to be applied “if all the elements of an invention are found in a combination of prior art references”).

Thus, Volkswagen argues that the Board’s judgment under § 103 “necessarily involved a finding that all the limitations of claim 1 were found in combination of the Campbell ’558 Patent

and Saito.” [Doc. 111 at 12]. “Even though the Board construed the ‘platinum coating’ term as part of its analysis of Ground 2 under 35 U.S.C. § 102, it is ‘axiomatic’ that the same claim term construction equally applies to analyses of all grounds of invalidity, as well as infringement.” [Doc. 111 at 11].⁹ Volkswagen’s argument means that construction of any term in claim 1 would be “necessary” to the separate finding of obviousness as to claim 1.

Here, however, the Board did not need to construe the “platinum coating” term of claim 1 in order to determine whether “all elements of the claims were disclosed in prior art.” *Think Products*, 419 F. Supp. 3d at 1082. The relationship between the Campbell ’558 Patent and ’758 Patent makes this clear – the ’558 Patent is one of two sources used to reach a finding on obviousness and is a parent patent of ’758. No claim construction was necessary to recognize that the same “platinum coating” language used in claim 1 also appears in ’558, which is incorporated into ’758 by reference.¹⁰ And regardless of whether every claim limitation must ordinarily be analyzed to make an obviousness determination, the Board did not undertake that analysis here.

The authority cited by Volkswagen is not to the contrary. Initially, most of Volkswagen’s legal authority on this point does not stand for the propositions Volkswagen asserts.¹¹ The relevant

⁹ The authority cited for this proposition is *Amgen, Inc. v. Hoechst Marion Roussel, Inc.*, 314 F.3d 1313, 1330 (Fed. Cir. 2003). *Amgen* states simply that “claims are construed the same way for both invalidity and infringement.” *Id.*

¹⁰ Which is not to say that the language of ’558 is the exact breadth of the claims of ’758.

¹¹ Volkswagen cites, for example, *Persin Pharmaceuticals, LLC v. Alvogen Malta Operations, Ltd.*, 945 F.3d 1184, 1189-91 (Fed. Cir. 2019) for the proposition that “A claim is invalid under § 103 if, *inter alia*, each limitation of the claim can be found in a combination of prior art references.” [Doc. 111 at 12]. *Persin Pharmaceuticals* does not actually set forth this test; it does discuss establishing obviousness through inherency. In *Personalized Media Communications, LLC v. Apple Inc.*, 952 F.3d 1336, 1338-39 (Fed. Cir. 2020), the patent owner challenged certain claim constructions underpinning a PTAB finding of unpatentability based on anticipation and obviousness. *Id.* at 1337-38. The court reviewed the Board’s claim constructions *de novo*. *Id.* at 1339. From this, Volkswagen concludes that “[b]ecause the issue of claim construction falls within the scope of a judgment of invalidity under § 103 . . . any limitation recited in claim 1” could have been challenged on appeal. [Doc. 111 at 13]. Similarly, 37 C.F.R. § 42.104 is cited for the proposition that “[u]nder the Board’s rules, the *same* claim construction of the ‘platinum coating thereon’ term had to be applied under each of these grounds of unpatentability.” [Doc. 111 at 12]. This may be an accurate statement of law, but it does not appear in 37 C.F.R. § 42.104(b)(1)-(4). The regulation simply requires that a petition for *inter partes* review provide a statement of the relief requested for each claim challenged, including, *inter alia*, “[h]ow the challenged claim is to be construed.” See *id.*

authority demonstrates that Volkswagen has not carried its burden of showing the “platinum coating” claim construction was actually necessary to the outcome of the IPR.

First, the Federal Circuit’s decision in *Phil-Insul Corp. v. Airlite Plastics Co.*, 854 F.3d 1344 (Fed. Cir. 2017), is distinguishable because construction of the subject term was dispositive of the issue of non-infringement in the prior case. In the first infringement action, claim 1 of the patent was asserted against different defendants with similar products. *Id.* at 1347. Though claim 1 was cancelled, all its limitations also appeared in claim 2, the allegedly infringing claim in the *Phil-Insul* case. *Id.* at 1352. The defendant moved for summary judgment of noninfringement, arguing preclusion based on the prior decision. *Id.* at 1347. The district court applied collateral estoppel and the plaintiff appealed. *Id.*

On appeal, the Federal Circuit rejected the argument that a determination of noninfringement had been made “without reference to claim construction.” *Id.* at 1358. The plaintiff argued that the court’s claim construction had been dispositive of one theory of infringement, but not another. *Id.* The Federal Circuit disagreed:

It is well established, however, that an infringement analysis is a two-step process. The court must: (1) determine the scope and meaning of the patent claims asserted; and (2) compare the properly construed claims to the allegedly infringing device.

Id. at 1358. And the district court had stated that “[t]he construction of those terms was dispositive of the issue of non-infringement in [the prior] case.” *Id.* at 1352; *see Cisco Sys., Inc. v. Capella Photonics, Inc.*, Case No. 20-cv-01858, 2020 WL 4923697 (N.D. Cal. Aug. 21, 2020) (construction of claim in IPR was critical and necessary where claim could not have been invalidated by prior art if Board had adopted competing construction).

Thus, in *Phil-Insul*, the Federal Circuit did not rely solely on the legal elements of the infringement analysis to find estoppel. It also recognized that the subject claim construction had

in fact been dispositive of the issue of non-infringement in the initial action. *See also TecSec, Inc. v. International Business Machines Corp.*, 731 F.3d 1336 (Fed. Cir. 2013) (“Because claim construction was neither actually determined by nor critical and necessary to [the] summary affirmance . . . collateral estoppel does not preclude the present challenge.”).

Volkswagen also relies on *Princeton Digital Image Corp. v. Konami Digital Ent., Inc.*, Civil Action Nos. 12-1461, 13-335, 2017 WL 2615739 (D. Del. June 16, 2017), an unreported decision in an infringement action in the United States District Court for the District of Delaware. In a Report and Recommendation, the Magistrate Judge analyzed a means-plus-function term that appeared in claim 12, which depended from asserted claim 14. *Id.* at *3. The defendants argued that issue preclusion barred further construction because PTAB had construed the function of the claim term in the IPR. *Id.* In the IPR, the plaintiff had advocated for the construction adopted by PTAB, then opposed that same construction in the district court. *Id.*

Plaintiff disputed whether the precise issue was actually adjudicated, but the magistrate judge found the elements of issue preclusion were met. *Id.* at *4. Relevant here, it found that “the function *was* construed in the prior proceeding, even though issues of indefiniteness/insufficient structure were not applicable in that proceeding.” *Id.* The magistrate judge further found that “claim construction regarding the function for this term was essential to the judgment, as it was part and parcel of PTAB’s determination.” *Id.* It cited the Board’s statement that “several terms [including this one] relevant to this decision are means-plus-function claim terms.” *Id.* Plaintiff argued that dependent claim 14 was not at issue in the IPR, but rather the independent claim in which the term appeared. *Id.* In adopting the Report and Recommendation, the district court rejected this argument and found that issue preclusion applied. *Princeton Digital Image Corp. v.*

Konami Digital Entertainment, C.A. No. 12-1461, C.A. No. 13-335, 2017 WL 6375173, *3 (D. Del. Dec. 13, 2017)

Thus, Volkswagen's lead references suggest that to be "necessary" to the judgment, the disputed claim construction must be more than necessary in the abstract. They must be logically necessary to the outcome, not merely implicit in the legal standard that frames the determination. Even in *Princeton Digital*, perhaps Volkswagen's strongest support, the Board's written decision stated that the disputed claim terms were "relevant" to the judgment and the magistrate judge found their construction "essential." *Princeton Digital*, 2017 WL 2615739 at *4.

Here, the Board's obviousness determination never mentions the platinum coating term. Nor has Volkswagen shown that the claim construction was substantively necessary to the Board's reasoning or determination. Volkswagen might have explained why the Board's construction of the platinum coating term as one that "intimately and entirely" coats the alumina support was required for the Board to find that a skilled artisan would have reason to combine prior art references to obtain claim 1 of the '758 Patent. But Volkswagen has not pointed to anything in the extensive record that shows why the Board would have needed to construe the platinum coating term in order to make its obviousness finding. The construction of the "platinum coating" term was not expressly part of the Board's obviousness determination and not logically indispensable to it. It was made – arguably unnecessarily – in connection with a separate asserted ground of invalidity as to a different prior patent. More is required for a claim construction to be "necessary" to the outcome of an IPR such that collateral estoppel applies.

iii. Full and Fair Opportunity to Litigate & Finality

Volkswagen argues that "[b]ecause the issue of claim construction falls within the scope of a judgment of invalidity under § 103, EmeraChem, on appeal, could have challenged the Board's

construction of any limitation in recited claim 1.” [Doc. 111 at 13]. As discussed above, the authority provided for this assertion is inapposite. *See supra*, n. 11. EmeraChem asserts it “did not have standing” to appeal the construction of this term because it prevailed on Ground 2, on which the Board issued its “overly narrow” claim construction. [Doc. 106 at 8]. Because the Court finds that Volkswagen has not demonstrated two other elements of collateral estoppel, it will not reach the issue of whether EmeraChem had a full and fair opportunity to litigate the claim construction or the finality of the decision.

2. Prosecution Disclaimer Does Not Apply

The doctrine of prosecution disclaimer “precludes patentees from recapturing through claim interpretation specific meanings disclaimed during prosecution.” *Omega Eng’g Inc. v. Raytek Corp.*, 334 F.3d 1314 (Fed. Cir. 2003). “[S]tatements made by a patent owner during an IPR proceeding, whether before or after an institution decision, can be considered for claim construction and relied upon to support a finding of prosecution disclaimer.” *Aylus Networks, Inc. v. Apple, Inc.*, 856 F.3d 1353, 1362 (Fed. Cir. 2017). However, courts will not apply the doctrine “where the alleged disavowal of claim scope is ambiguous.” *Omega Eng’g*, 334 F.3d at 1324; *Northern Telecom Ltd. v. Samsung Electronics Co.*, 215 F.3d 1281, 1293-95 (Fed. Cir. 2000) (where inventors’ statements were amenable to multiple reasonable interpretations, remarks were ambiguous and the court “simply [could] not tell”). “For prosecution disclaimer to attach . . . the alleged disavowing actions or statements made during prosecution [must] be both clear and unmistakable.” *Id.* at 1325-26.

Volkswagen’s IPR Petition challenged claim 1 of the ’758 Patent on the basis that it was anticipated by Takeshima. [Doc. 105-1 at 55-65]. The Petition for *Inter Partes* Review recites that “Takeshima discloses that the catalyst absorber comprises an alumina support (“carrier”) with

platinum and barium oxide thereon.” [Id. at 55]. Volkswagen argues that “based on arguments made in its Patent Owner’s Response . . . EmeraChem was able to overcome the prior art Takeshima solely because the subject platinum coating limitation was construed to require the alumina support being entirely coated with platinum, as opposed to merely having some amount of platinum disposed thereon.” [Doc. 111 at 17 (internal punctuation omitted)]. According to Volkswagen, “EmeraChem argued to the Board” that claim 1 was not anticipated by Takeshima “for the sole reason that” Takeshima fails to disclose an alumina support with a platinum coating thereon. [Doc. 105 at 13]. Volkswagen overstates the EmeraChem’s position in the IPR.

In its Patent Owner’s Response, EmeraChem argued that “Takeshima fails to disclose – either expressly or inherently – the element from claim 1 requiring an alumina support with a platinum coating thereon.” [Doc. 98-1 at 111]. EmeraChem stated:

Interestingly, Petitioner never specifically asserts that Takeshima shows an alumina support coated with platinum. See Petition, pgs. 29 and 34. Rather, Petitioner simply states that Takeshima’s alumina support has platinum “disposed thereon.” *Id.* Also, the portions of Takeshima cited for this proposition simply state that substances such as platinum may be “carried” on platinum [sic].

...

A reference’s indication that alumina serves as a carrier for platinum does not indicate that the alumina is “coated” with platinum.

[Doc. 98-1 at 122-23]. EmeraChem also offered the Declaration of Dr. Crocker, explaining that “[w]hen a reference refers to a carrier, this does not indicate that the carrier is coated with the carried material.” [Doc. 105-1 at 95].

Contrary to Volkswagen’s contention, EmeraChem did not “expressly distinguish[] the terms ‘coating’ and ‘disposed thereon.’” [Doc. 105 at 13]. The record suggests the term “disposed on” was actually used by Volkswagen to describe Takeshima. [Doc. 98-1 at 122-23; *see* Doc. 105-1 at 56-57]. In response, EmeraChem pressed the distinction between platinum *carried* on a

support, as recited in Takeshima, and the platinum *coating* on a support disclosed by '758. This does not constitute a “clear and unmistakable” disavowal of claim 1 as describing an alumina support with platinum disposed over the support.

Volkswagen does not identify any part of the record in which EmeraChem unambiguously argued that Takeshima cannot anticipate '758 because Takeshima discloses platinum “disposed on” an alumina support while '758 requires a platinum coating. [*Cf.* Doc. 105 at 12].¹² The prosecution history cited therefore does not prevent EmeraChem from arguing that a platinum “coating” is one that is “disposed” on or over an alumina support.

3. Analysis of Intrinsic and Extrinsic Evidence

Having found that neither collateral estoppel nor prosecution disclaimer prevent the parties from raising their claim construction arguments, the Court turns to construing the “platinum coating” term. “[C]laim terms must be construed in light of the entire patent, including the written description and prosecution history.” *Lochner Techs., LLC v. Vizio, Inc.*, 567 F. App’x 931, 939-40 (Fed. Cir. 2014). Volkswagen’s interpretation of the term as “an alumina support entirely covered by at least a continuous monolayer of platinum” is not supported by the language of the '758 or '558 patents and excludes a preferred embodiment. EmeraChem’s construction substitutes “disposed over” for “disposed on,” without explaining the reason for this departure from the language of the specification. Based on the claims, specification, and prosecution history of the '758 patent and incorporated '558 patent, the Court construes “an alumina support with platinum coating thereon” to mean “an alumina support with platinum disposed on its surfaces.” The extrinsic evidence presented on this issue confirms this construction is correct.

¹² Volkswagen cites to the Patent Owner’s Response as “arguing that an alumina support with platinum disposed thereon is *not* an alumina support with a platinum coating thereon.” [Doc. 98 at 12]. The portion of the record cited by Volkswagen does not support this statement.

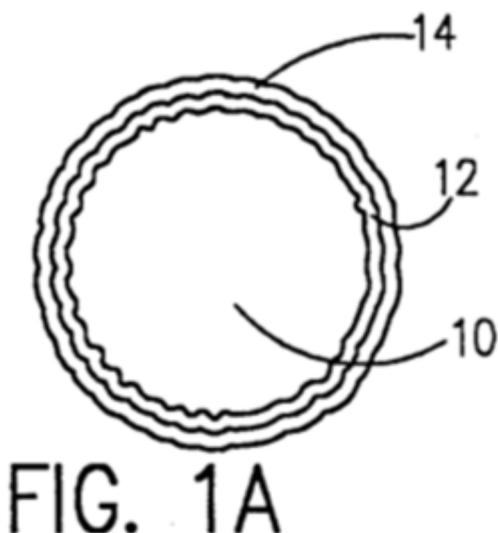
Looking first to the claim itself, claim 1 does not define or elaborate on the term “a platinum coating thereon.” The ’758 Patent has one other independent claim, claim 13, which describes a catalyst/absorber, such as platinum, “*disposed on* a high surface area support” with the catalyst “intimately and entirely coated” with absorber. ’758 Patent, col. 10:23-28. The ’758 Patent also discusses the Campbell ’558 Patent as follows:

In [the ’558 Patent], which is incorporated herein in its entirety, a catalyst/absorber is described comprising an oxidation catalyst specie . . . *disposed on* a high surface area support.... For example, a support with an alumina washcoat *disposed thereover*, a platinum catalyst disposed on the washcoat . . .

Id. at col.1:56-67 (emphasis added); [Doc. 98-1 at 60].

Claim 1 of Campbell ’558 claims “a material for removing gaseous pollutants from combustion exhaust comprising an oxidation catalyst specie selected from platinum, [etc.] . . . *disposed on* a high surface area support, said catalytic component being intimately and entirely *coated* with an absorber.” ’558 Patent, col. 12:29-38. The phrase “intimately and entirely” was added during the prosecution of the patent and does not appear elsewhere. [Doc. 98-1 at 263-64].

Figure 1a of Campbell ’558 depicts “a catalyst absorber sphere in a preferred embodiment”:



'558, col. 3:36-37. Campbell explains that Figure 1a "shows a catalyst absorber made up of an alumina sphere **10** with a *platinum coating* **12** and a carbonate coating **14** thereon." *Id.* at col 4:65-5:1. Thus, Campbell claim 1 discloses an oxidation catalyst specie such as platinum "disposed on" a high surface area support, while the preferred embodiment is described as "an alumina sphere with a platinum coating."

Since the '758 Patent discloses an alumina support with "platinum coating thereon" and Campbell '558 uses the same "platinum coating" language to describe a preferred embodiment, the Board construed the language in claim 1 in light of the preferred embodiment in '558, specifically Figure 1a. The Board held:

Given that the language of claim 1 of the '758 is the same as the language describing the mentioned embodiment, we hold that the language "an alumina sphere [sic support] with a platinum coating thereon" is best defined as one in which the platinum is intimately and entirely coating the alumina support, as shown in Figure 1a of the '758 [sic '558] Patent.

[Doc. 98-1 at 65-66 (error in original)].¹³ In so holding, the Board acknowledged that its claim construction was at odds with Dr. Crocker's testimony, but found that Dr. Crocker did not explain his position regarding Figure 1. [*Id.* at 66]. Thus, the Board disregarded uncontested expert testimony – relied on by both parties – that an alumina support with platinum coating does not mean platinum that forms a continuous monolayer. [See Doc. 98-1 at 64].

Having carefully reviewed the Board's analysis of the platinum coating term, the Court finds it unconvincing. The Board's claim construction appears to have turned almost entirely on its determination that Figure 1a shows non-porous or continuous layers. [See Doc. 98-1 at 66]. Yet there is no indication of the scale of the drawing and nothing in the patent suggests that the "schematic depiction" is technically accurate at every level of abstraction or magnification. '558

¹³ It appears that the Final Written Decision intended to refer to "an alumina support" rather than an "alumina sphere." [Doc. 98 at 11]. The referenced figure appears in the '558 Patent, col. 3:36-37.

Patent, col. 3:34-35. Rather, claim 1 of '558 discloses platinum “disposed on” an alumina support. Figure 1a uses the phrase “platinum coating” to describe a preferred embodiment of that invention. There is no indication in the patent that claim 1 claims something narrower than what is depicted and described in the preferred embodiment. Rather, '558 appears to use the “coating” and “disposed on” language synonymously. Likewise, the specification of '758 describes '558 as disclosing a catalyst specie “disposed on” an alumina support.

But claim 13 also discloses a catalyst specie, such as platinum, “disposed on a high surface area support.” '758 Patent, col. 10:23-30. Volkswagen argues that claim differentiation requires claim 1’s “platinum coating” term to be construed as “an alumina support entirely covered by at least a continuous monolayer of platinum” in order to differentiate it from the platinum “disposed on” a high surface area support, as recited in claim 13. [Doc. 105 at 14-15]. Ordinarily “[t]here is presumed to be a difference in meaning and scope when different words or phrases are used in separate claims.” *Tandon Corp. v. U.S. Intern. Trade Comm'n*, 831 F.2d 1017, 1024 (Fed. Cir. 1987). That presumption becomes significant if reading the differences as synonymous “would make a claim superfluous.” *Id.* But, “two claims which read differently can cover the same subject matter” and “claims are always interpretable in light of the specification that led to the patent.” *Id.* (quoting *D.M.I., Inc. v. Deere & Co.*, 755 F.2d 1570, 1574 n.2 (Fed. Cir. 1985)).

Here, however, claim 13 would not be superfluous if “platinum coating” in claim 1 were construed to mean “platinum disposed on an alumina support.” Claim 13 discloses a catalyst/absorber and includes additional limitations related to temperature, pressure, and so forth. And, there are competing interpretive canons here. Volkswagen argues that its “continuous monolayer” construction “comports with” the Board’s “intimately and entirely coated” construction. [Doc. 105 at 7-8]. But claim 13 already uses the phrase “intimately and entirely

coated” to refer to a different coating – the coating of absorber material on the catalytic component. ’758 Patent, col. 10:29-30. This is particularly significant because the “intimately and entirely” phrase was added to claim 13 by amendment. [See Doc. 98-1 at 189].

Moreover, “[i]t is not unusual that separate claims may define the invention using different terminology, especially where (as here) independent claims are involved.” *Hormone Rsch. Found., Inc. v. Genentech, Inc.*, 904 F.2d 1558, 1567 n. 15 (Fed. Cir. 1990); *see Apple, Inc. v. Ameranth, Inc.*, 842 F.3d 1229, 1238 (Fed. Cir. 2016) (“This court has declined to apply the doctrine of claim differentiation where ‘the claims are not otherwise identical in scope.’” (quoting *Indacon, Inc. v. Facebook, Inc.*, 824 F.3d 1352, 1358 (Fed. Cir. 2016))). It makes more sense for claim 1 and 13 to describe a similar catalyst coating in similar terms than it does for claim 13 to internally use two different phrases – “disposed on” and “intimately and entirely coating” – to actually mean the same thing. *See Peter Menell, et al., Patent Case Management Judicial Guide*, §5.2.3.2.4, pg. 5-70 (Fed. Jud. Ctr. 2016) (“In the case of two independent claims, the doctrine of claim differentiation does not apply because patent drafters are free to, and commonly do, claim an invention using multiple linguistic variations in multiple independent claims.”). Volkswagen’s construction also fails to make sense of related language in the ’558 Patent, describing a catalyst as merely “disposed on” a support, while the absorber “intimately and entirely” coats the catalyst.

Volkswagen urges the Court to rely on Figure 1a to construe “coating” as a continuous monolayer because it is a qualitative term, not quantitative. [Doc. 105 at 15 (*citing Hockerson – Halbenstadt, Inc. v. Converse, Inc.*, 183 F.3d 1369, 1374-75 (Fed. Cir. 1999))]. But as Volkswagen argued to the Board, ’558 “describes the amount of platinum” that would be on the support. [Doc. 100-8 at 16-17]; ’558 Patent, col. 4:4-6. And “it is well established that patent drawings do not define the precise proportions of the elements and may not be relied on to show particular sizes if

the specification is completely silent on the issue.” *Nystrom v. TREX Company*, 424 F.3d 1136, 1149 (Fed. Cir. 2005). As explained below, the patent is not completely silent on the issue – it discloses an embodiment in which the amount of platinum would not completely coat the alumina support with a continuous monolayer.

Specifically, EmeraChem shows that Volkswagen’s construction would remove a preferred embodiment from the patent. In the preferred embodiment disclosed in ’558, “[t]he final catalyst absorber had a coating of platinum in the amount of 0.23 weight percent added to the alumina.” ’558 Patent, col. 5:43-45. EmeraChem presents the declaration of Dr. Calvin Bartholomew, which indicates that “[i]n a typical catalyst, the amount that is used is much less than the amount that would be needed to fully cover the surface of the alumina.” [Doc. 100-2 at ¶ 27]. He explains that “[a] typical quantity of platinum metal for the subject invention is 0.2 wt%,” citing the ’558 patent. [Id.]. This opinion is consistent with the testimony of Dr. Crocker in the IPR that an alumina support with platinum coating thereon means “an alumina support material onto which platinum has been deposited, but . . . that does not imply that the platinum forms a continuous monolayer.” [See Doc. 98-1 at 64]. Volkswagen referenced and relied on this testimony in the IPR. [Doc. 100-8 at 15 (“Patent Owner’s expert, Dr. Crocker, explained that a person of ordinary skill would not entirely coat the alumina support with platinum, but rather would widely disperse platinum atoms on the alumina surface.”)]. EmeraChem relied on the same testimony. [Doc. 98-1 at 123].

Although the Court construes the claim on intrinsic evidence alone, even if the intrinsic evidence left ambiguity, the extrinsic evidence would confirm the Court’s construction. Based on the uncontested expert opinion presented, the Court finds that a person of ordinary skill in the art would not interpret a “platinum coating” as one that completely covers the alumina support with a continuous monolayer. At a .23 wt% percent loading, the platinum coating described in

'558 would not in fact completely cover the alumina support in a continuous monolayer. Nothing in the record prevents the application of this meaning as to claim 1. Accordingly, the Court further finds that a person of skill in the art would understand the "platinum coating" term in claim 1 as disclosing platinum disposed on but not completely covering the alumina support. Based on these factual findings, Volkswagen's interpretation of "platinum coating" would exclude a preferred embodiment of Campbell '558, incorporated in its entirety into the '758 patent. "A claim construction that excludes a preferred embodiment, moreover, 'is rarely, if ever, correct.'" *SandDisk Corp. v. Memorex Prod., Inc.*, 415 F.3d 1278, 1285 (Fed. Cir. 2005) (quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1583 (Fed. Cir. 1996)).

Volkswagen's argument that extrinsic evidence, and specifically Dr. Bartholomew's declaration, cannot be considered is premised on estoppel principles and is rejected for the reasons previously stated. [See Doc. 105 at 10-11].¹⁴ "[E]xpert testimony can be useful to a court for a variety of purposes, such as to provide background on the technology at issue, to explain how an invention works, to ensure that the court's understanding of the technical aspects of the patent is consistent with that of a person of skill in the art, or to establish that a particular term in the patent or the prior art has a particular meaning in the pertinent field." *See Phillips*, 415 F.3d at 1318; *see Anglefix, LLC v. Wright Medical Tech., Inc.*, No. 2:13-cv-2407, 2015 WL 9581865, *4 (W.D. Tenn. Dec. 30, 2015) ("A court may rely on extrinsic evidence so long as the evidence does not contradict the intrinsic record."). And while the Federal Circuit has cautioned against reliance on "conclusory, unsupported assertions by experts as to the definition of a claim term," *Phillips*, 415 F.3d at 1318, Dr. Bartholomew's opinion regarding whether the amount of platinum in the

¹⁴ For avoidance of doubt, the Court has not relied on the figures that appear in Dr. Bartholomew's book, "Fundamentals of Industrial Catalytic Processes," published March 16, 2015. [See Doc. 105 at 11]. Dr. Bartholomew avers, however, that the "coating" term would have the same meaning in 1994 as it does now. [Doc. 100-2 at ¶ 35].

preferred embodiment would completely coat the support is not an unsupported assertion about the claim term. It is an explanation of a technical aspect of the patent that the Court would have no way of understanding without expert testimony.

Notably, Volkswagen does not dispute the accuracy of Dr. Bartholomew's opinion that a platinum loading of 0.23 wt% would not completely coat the alumina support. Instead, it argues that there are "at least two embodiments" disclosed in the Campbell '558 patent: (1) the preferred embodiment depicted in Figure 1a, and (2) the embodiment having a platinum loading of 0.23 wt%. [Doc. 105 at 16]. Volkswagen does not point to anything in the patent to support this characterization. The patent identifies Figure 1a and describes the method of making the catalyst absorber, concluding that "[t]he final catalyst absorber had a coating of platinum in the amount of 0.23 weight percent added to the alumina." '758 Patent, col. 5:43-45. Nothing in the specification suggests that the 0.23 wt% relates to a different embodiment than that depicted in Figure 1a. Volkswagen's contention that Figure 1b shows the alumina support "at the microscopic pore level," [Doc. 105 at 18], is likewise unsupported by the patent itself, which simply identifies the figure as "a magnified [sic] drawing of a portion of the surface of the catalyst absorber sphere." '558 Patent, col. 3: 38-40.

The Court's construction of the "platinum coating" term is also consistent with the PTAB's interpretation of Campbell '558 on *inter partes* review. There, the Board construed the second coating term – a catalytic component being intimately and entirely coated with an absorber – rather than the platinum coating term. [Doc. 98-1 at 58-59]. However, on a motion for rehearing, the Board noted that it did not interpret "claim 1 as requiring a continuous catalyst layer." [Doc. 98-1 at 333-34]. On appeal, EmeraChem argued that certain prior art did not teach, *inter alia*, a continuous layer of oxidation catalyst. *EmeraChem Holdings, LLC v. Volkswagen Grp. Of Am.*,

Inc., 714 F. App'x 995, *997 (Fed. Cir. 2017). The Federal Circuit rejected the argument as a basis for the appeal: “That argument, however, is irrelevant because the ’558 patent claims do not require *the catalyst* to form a continuous monolayer. Instead, the claims only require the *absorber* to entirely coat the catalyst.” *Id.* at 997-98. Accordingly, the prosecution and appeal history of the incorporated Campbell ’558 Patent suggest that claim 1 of Campbell ’558 was not understood to require a continuous layer of catalyst.

Finally, EmeraChem argues that platinum disposed *over* the surfaces of an alumina support is different than platinum “disposed on” a support, but does not explain why this is so. [Doc. 112 at 12]. While “disposed over” is quite similar, EmeraChem has not referred the Court to anything in the patents that supports this substitution.

Based on the intrinsic evidence, the Court finds that a person of skill in the art would understand “an alumina support with a platinum coating thereon” to mean “an alumina support with platinum disposed on its surfaces.” Nothing in the patent requires the alumina support to be entirely covered by at least a continuous monolayer of platinum and the expert testimony is to the contrary. The Court is not persuaded that a person of ordinary skill in the art would read Figure 1a in isolation to overcome the totality of the relevant patents, which describe platinum “disposed on” a support.

C. Claim Grouping 3: “Passing Said Stream of Regenerating Gas”

Term	Claims	EmeraChem	Volkswagen
“passing said stream of regenerating gas ... over said devitalized absorber”	Claim 1	NO CONSTRUCTION NEEDED In the alternative, the devitalized absorber is contacted with a stream of regenerating gas	Passing the stream of regenerating gas at a level or layer higher than the devitalized absorber

“passing said gaseous stream over said exhausted catalyst/absorber”	Claim 13	NO CONSTRUCTION NEEDED In the alternative, the exhausted catalyst and absorber is contacted with a stream of regenerating gas	Passing the gaseous stream at a level or layer higher than the exhausted catalyst/absorber.
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Defendants seek a construction of the term “passing . . . over,” asserting it has an elevational meaning, *i.e.*, that the regenerating gas is “above” the absorber relative to the Earth. Plaintiff contends “passing . . . over” is a plain language term that requires no construction. [Doc. 100 at 22]. If a construction is required, it means that the devitalized absorber is contacted with a stream of gas. [*Id.*]. Neither party contends this is a technical term, a term of art, or derives special meaning from the patent. Rather than explaining how a person of skill in the art would construe the “passing . . . over” term, the parties rely on general language references – a dictionary entry and a thesaurus entry. In the absence of evidence demonstrating how a person of skill in the art would construe the claim, the Court declines to limit the scope of the claim as proposed by the parties. After resolving the parties’ dispute, the Court will decline to further construe the term.

Defendants initially argued that because the ’758 specification does not describe how the regenerating gas is passed over the devitalized absorber, the Court should look to the dictionary definition. According to Volkswagen, the primary definition of “over” is “above or higher” than something else, while “passing” means “going by or past.” [Doc. 98 at 17].¹⁵ They reason that “passing over” means passing the stream of regenerating gas at a level or layer higher than the devitalized absorber. But “over” can mean many things – across the brim, from one side to another, across, above, or through. *Over*, Merriam-Webster Dictionary, <https://www.merriam-webster.com/dictionary/over>. As Plaintiff points out, a synonym of “passing over” is “to make

¹⁵ This definition is actually the adjective form, *e.g.* a passing pedestrian, while the claim uses the word as a verb, *e.g.*, passing the salt. See *Passing*, Merriam-Webster Dictionary, <https://www.merriam-webster.com/dictionary/passing>. The distinction is immaterial, as Defendants use the word “passing” in their construction anyway.

one’s way through, across, or over.” [Doc. 100 at 22; Doc. 106 at 16]. Based on this synonymous phrase, Plaintiff contends “passing . . . over” should be construed as a gaseous stream contacting, or going “across,” the devitalized absorber. [*Id.*].

Plaintiff shows that no elevational limitation appears in the ’758 Patent. [*Id.* at 22-23]. Plaintiff also cites to figures in the ’558 Patent which purportedly show gas streams flowing across or through the catalyst/absorber. [Doc. 100 at 22-23]. Defendants respond that the “gas streams” pictured show the combustion exhaust stream flowing across and through the catalyst/absorber, not the regenerating gas. [Doc. 105 at 24]. Plaintiff does not dispute Defendants’ observation that the drawings in ’558 depict combustion exhaust, not regenerating gas, flowing across the catalyst/absorber. [See Doc. 105 at 24].

While initially urging the Court to adopt a dictionary definition, Defendants’ reply brief focuses on Takeshima, arguing Plaintiff’s thesaurus entry cannot “supersede Takeshima.” [Doc. 111 at 26]. Defendants interpret Takeshima as “illustrating how NO_x is removed from the devitalized absorber into the exhaust stream and then reduced by the regenerating gas flowing above the devitalized absorber.” [Doc 111 at 26]. According to Defendants, “CO and HC reducing agents in Takeshima’s regenerating gas do not contact the devitalized absorber.” [*Id.*]. But though a person of ordinary skill in the art is presumed to be familiar with prior art, Defendants fail to show why a person of ordinary skill in the art would conclude that claim 13 tracks Takeshima. They do not argue, for example, that Takeshima uses the “passing . . . over” phrase or similar terminology.

Defendants also argue that “passing over” cannot mean “contacting,” because other patents show that EmeraChem “knew how to recite ‘contacts’ rather than ‘passing over’ when EmeraChem wanted to.” [Doc. 111 at 25]. They point to the ’346 Patent and the ’558 Patent, which recite,

respectively, a “gaseous stream contacts the catalyst,” and “[t]he apparatus of the present invention supports the catalyst absorber and contacts the catalyst absorber with combustion exhaust.” [Doc. 111 at 25]. Similarly, in the original ’558 patent application, claim 34 apparently recited “[a] process of removing pollutants from combustion stack gases comprising contacting a catalyst absorber with said combustion stack gas . . .” [*Id.*]. But the rebuttable presumption of claim differentiation does not apply here. *See Karlin Tech., Inc. v. Surgical Dynamics, Inc.*, 177 F.3d 968, 973 (Fed. Cir. 1999) (doctrine of claim differentiation ordinarily means limitations in dependent claims cannot be read into the independent claim from which they depend). So, the use of the word “contacts” in the incorporated ’558 Patent and ’346 Patent does not require “passing . . . over” to mean something materially different in the ’758 Patent.

The ’758 Patent does not speak to the definition of “pass . . . over.” Neither party argues this is a technical term, instead submitting dictionary and thesaurus entries to support their respective proposals. The “passing . . . over” term “is comprised of commonly used terms; each is used in common parlance and has no special meaning in the art.” *Summit 6, LLC v. Samsung Elecs. Co., LTD*, 802 F.3d 1283, 1291 (Fed. Cir. 2015) (district court did not err in declining to further construe term after resolving “the heart of the parties’ disagreement”); *Finjan v. Secure Computing Corp.*, 626 F.3d 1197 (Fed. Cir. 2010) (no error where court rejected defendant’s proposed construction and found term had “its plain and ordinary meaning”). “[C]onstruction is unnecessary where . . . the parties merely dispute which synonym to use in construing a given claim term.” *Medline Inds., Inc. v. C.R. Bard, Inc.*, Case No. 16-3529, 2018 WL 6830327, at *2 (N.D. Ill. Dec. 28, 2018). Each party seeks a claim construction that narrows the scope of the claim in a way that is not supported by the evidence. Defendants seek to limit the “passing over” term to require passing altitudinally above, or “at a level or layer higher than.” Plaintiff asks the Court to

specify that the gaseous stream contacts the devitalized absorber. There is little, if any, intrinsic evidence to support either interpretation, and the parties do not explain why their preferred dictionary/thesaurus reference is more suitable than any other.

In the absence of any persuasive evidence that a person of ordinary skill in the art would interpret the term to include the parties' respective limitations, the Court will not rewrite or narrow the scope of the claim. The Court construes "passing . . . over" to encompass but not require the parties' narrower constructions. The jury will be instructed that the "passing . . . over" term (i) has its plain and ordinary meaning, which (ii) includes, but is not limited, to passing the regenerating gas above or at a level higher than the absorber, and (iii) includes, but is not limited to, contacting the absorber with the regenerating gas. The parties will be prohibited from arguing for a narrower claim scope at trial, leaving the jury to decide infringement and invalidity based on the scope of the claim as set forth by the Court. *See Finjan*, 626 F.3d at 1207 (no error where district court rejected proposed construction as unjustifiably narrowing the term's broad scope and prevented jury from reconstruing the term). Because the term is a non-technical, ordinary language term, further defining it would only serve to confuse the jury.

D. Claim Grouping 4: "to remove said nitrogen oxides from said devitalized absorber"

Term	Claims	EmeraChem	Volkswagen
"to remove said nitrogen oxides from said devitalized absorber"	Claim 1	NO CONSTRUCTION NEEDED In the alternative, reducing gases remove nitrogen oxide from the absorber and reduce the nitrogen oxide so that it is eliminated in the form of nitrogen	To cause all the nitrogen oxides previously absorbed in or on the devitalized absorber to be emitted from that absorber in the form of nitrogen oxides

“to remove said nitrogen oxides from said devitalized catalyst/absorber”	Claim 13	NO CONSTRUCTION NEEDED In the alternative, remove nitrogen oxide from the absorber and reduce the nitrogen oxide so that it is eliminated in the form of nitrogen	To cause all the nitrogen oxides previously absorbed in or on devitalized catalyst/absorber to be emitted from that catalyst/absorber in the form of nitrogen oxides
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The parties dispute the quantity of nitrogen oxides that must be removed from the catalyst/absorber and whether they are emitted in the form of nitrogen or nitrogen oxides. Defendants argue that “all” previously absorbed nitrogen oxides must be emitted. Plaintiff maintains that no construction is needed – “remove” is a plain and ordinary word and does not imply “remove all.” In the alternative, because the “said” nitrogen oxides is not stated in terms of quantity, Plaintiff argues the modifier “all” cannot be read into the claims. Finally, Defendants seek a construction of this term which specifies that nitrogen oxides are removed in the form of nitrogen oxides. Plaintiff argues this addition is not necessary to construe the term, and is also incorrect as the specification demonstrates nitrogen oxides are eliminated in the form of elemental nitrogen.

Claim 1 discloses a method of regenerating a devitalized absorber “having nitrogen oxides absorbed therein or thereon.” ’758 Patent, col. 9:28-29. It discloses the steps of the method: providing a stream of regenerating gas comprising an inert carrier gas and a reducing gas, “said reducing gas having an effective amount for removing said nitrogen oxides from said devitalized absorber,” and passing the stream of regenerating gas over “said devitalized absorber . . . having nitrogen oxides absorbed therein or thereon” for an effective time and at an effective temperature and at an effective space velocity “to remove said nitrogen oxides from said devitalized absorber to form a regenerated absorber.” *Id.* at col. 9:28-44.

Claim 13 likewise discloses a “method of regenerating a devitalized catalyst/absorber and having nitrogen oxides absorbed therein or thereon.” *Id.* at col. 10:13-15. The steps of the method include providing a stream of inert carrier gas and passing the gaseous stream over “said exhausted catalyst/absorber . . . having nitrogen oxides absorbed therein or thereon . . . to remove said nitrogen oxides from said devitalized catalyst/absorber to form a regenerated catalyst/absorber.” *Id.* at col. 10:16-38. Both claims thus disclose a method and its purpose – to form a regenerated catalyst/absorber.

The Summary of Invention explains: “[i]n the present invention, a devitalized catalyst/absorber is regenerated, that is, treated to restore the initial activity or to otherwise substantially improve the activity.” *Id.* at col. 2:47-50. “[T]he present invention is a method for regenerating devitalized absorber” by “contacting the devitalized absorber with a gaseous stream . . . to remove a portion of the nitrogen oxides.” *Id.* at col. 2:50-57.

Volkswagen argues the word “said” in the phrase “to remove said nitrogen oxides” refers back to the previously recited nitrogen oxides absorbed in or on the devitalized absorber. [Doc. 105 at 25]. According to Volkswagen, “said” nitrogen oxides thus means whatever quantity of nitrogen oxides was previously absorbed, requiring all previously absorbed nitrogen oxides to also be removed. [Doc. 105 at 25-26]. But the antecedent term does not contain or suggest a quantity, so the use of the word “said” cannot import a quantitative limitation. “Because the initial phrase carries no definitive numerosity, the anaphoric phrases do not alter the meaning in the slightest.” *Baldwin Graphic Sys., Inc, v, Siebert, Inc.*, 512 F.3d 1338, 1343 (Fed. Cir. 2008).

According to EmeraChem, the examples in the ’758 Patent also indicate that not all nitrogen oxides are removed during regeneration. [Doc. 100 at 24]. In Example 3, a regenerated absorber is shown to remove 85% of NO_x after 30 minutes, while the fresh absorber removes 90%

of NO_x. [See *id.*]. EmeraChem argues that this comparison demonstrates that not all nitrogen oxides are removed during regeneration. [*Id.*]. Volkswagen does not dispute this interpretation but offers its own. [Doc. 105 at 26]. The specification comments on the results of Example 1: “The efficiency for NO_x destruction was 99.96%; that is, only 0.04% of the NO_x absorbed was off gassed during regeneration.” ’758 Patent, col. 4:62-66. Volkswagen concludes that 100% of previously absorbed NO_x was removed. [*Id.*]. EmeraChem counters that other examples in the patent show significantly less NO_x was destroyed, so the claim terms cannot be read to require the complete destruction of NO_x. [Doc. 112 at 24].

A person of ordinary skill in the art would read the term “to remove said nitrogen oxides from said devitalized absorber” in light of the patent as a whole, including the summary of the invention and examples in the patent. Both claim 1 and claim 13 describe a method “to form a regenerated catalyst/absorber.” The Summary of Invention states that a devitalized catalyst/absorber is regenerated by treating it to “restore to the initial activity or to otherwise substantially improve the activity.” ’758 Patent, col. 2:47-51. The invention’s method of regenerating the devitalized absorber “remove[s] a portion of the nitrogen oxides.” *Id.* at col. 2:56. The examples do not limit the claims because some indicate that not all nitrogen oxides are removed by regeneration. Accordingly, a person of ordinary skill in the art would not limit the term “said nitrogen oxides” to “all” nitrogen oxides previously absorbed.

Volkswagen also urges the Court to construe “to remove said nitrogen oxides” as requiring emission in the form of nitrogen oxides. EmeraChem argues the term needs no construction, and in the alternative, that the nitrogen oxides are emitted in the form of nitrogen. [Doc. 98 at 18-19]. Volkswagen says the ’758 Patent does not disclose the mechanism by which nitrogen oxides are removed from the devitalized absorber. [*Id.* at 17]. It urges the Court to rely on the prior art

Takeshima reference to understand the term. [Id.]. But as EmeraChem points out, the '758 patent teaches that “the reactant gas reduces the nitrogen oxides to eliminate nitrogen.” '758 Patent, col. 3:22-23; [Doc. 106 at 18]. The comments to Example 1, relied on by Volkswagen for this same set of claim terms, likewise state: “The NO_x destroyed was converted to elemental nitrogen.” '758 Patent, col. 4:65-67. Similarly, in Example 5, “only 0.15% of the NO_x absorbed was desorbed as NO_x, and the remainder was converted to elemental nitrogen.” *Id.* at col. 6:45-49.

Volkswagen does not renew its argument regarding Takeshima in its reply brief and never addresses the language in the specification that indicates nitrogen oxides may be converted to elemental nitrogen. After asserting that the '758 Patent “does not disclose the mechanism by which the absorbed NO_x is removed from the devitalized absorber,” [Doc. 98 at 17], Volkswagen pivots to argue that the claims expressly state that “nitrogen oxides” are removed from the devitalized absorber, not that nitrogen is removed. [Doc. 111 at 28]. But removal of nitrogen oxides does not necessitate removal in the form of nitrogen oxides. And while Volkswagen is careful to argue that “[t]here is no legal basis to rewrite this limitation by adding ‘and reduce the nitrogen oxide so that it is eliminated in the form of nitrogen,’” the same logic applies to Volkswagen’s construction. [Id. at 28]. In light of the clear language of the specification, the Court need not turn to Takeshima to resolve this dispute.

The Court can fully construe “to remove said nitrogen oxides from said devitalized catalyst/absorber” without specifying a form of removal. While the Court is cognizant of its duty to construe claim terms that are fundamentally in dispute, the parties do not genuinely dispute the *meaning* of the “to remove” term. Rather, Volkswagen seeks to add to the claim to specify the form in which nitrogen oxides are removed. Though EmeraChem “agrees that there is no basis for reading any specific type of nitrogen oxide removal into the claims,” [Doc. 106 at 18], its

alternatively-proposed construction would do the same. The specification and examples clearly contradict Volkswagen's construction, indicating that nitrogen oxides can be removed and emitted in the form of nitrogen. The terms that are purportedly in dispute do not specify the form in which nitrogen oxides are removed, and the Court will not rewrite them to add such a limitation. This is not to say that the patent does not identify forms of removal, but only that the claim terms the parties have identified for construction do not include such a limitation.

Having rejected the parties' proposed constructions, the Court declines to further construe the claim terms. The Court construes "to remove said nitrogen oxides from said devitalized absorber" according to its ordinary meaning. The term does not require all nitrogen oxides to be removed and it is not limited to removal of nitrogen oxides in a specific form.

E. Claim Grouping 5: "to form a regenerated catalyst/absorber"

Term	Claims	EmeraChem	Volkswagen
" to form a regenerated absorber "	Claim 1	NO CONSTRUCTION NEEDED In the alternative, to form an absorber from which absorbed or adsorbed nitrogen oxides have been removed	To form an absorber with no nitrogen oxides absorbed therein or thereon.
" to form a regenerated catalyst/absorber "	Claim 13	NO CONSTRUCTION NEEDED In the alternative, to form an absorber from which absorbed or adsorbed nitrogen oxides have been removed	To form a catalyst/absorber with no nitrogen oxides absorbed therein or thereon.

Volkswagen's opening *Markman* brief identifies this term for construction but does not explicitly present an argument or evidence in support. [Doc. 98 at 17-19]. EmeraChem argues the construction should be rejected on this basis alone. In a single sentence response, Volkswagen says it did not waive its request for construction because the opening brief addressed it as follows: "The

'758 Patent Specification explains that up to 99.9% of the nitrogen oxides are removed from the devitalized absorber." [Doc. 111 at 28-29; *see* Doc. 98 at 19].

The two sentences Volkswagen devotes to its proposed construction are insufficient to create a fundamental dispute between the parties as to the construction of the claim terms. Moreover, Volkswagen's proposal is inconsistent with the Court's construction of the "to remove said nitrogen oxides" term. The Court therefore declines to construe the term.

F. Claim Grouping 6: "said catalytic component being intimately and entirely coated with an absorber material"

Term	Claims	EmeraChem	Volkswagen
"said catalytic component being intimately and entirely coated with an absorber material"	Claim 13	An absorber material disposed over the catalyst with a quantity of absorber material at least sufficient to cover the catalyst with a monolayer.	All of the catalytic component must be completely covered by at least a monolayer of the absorber material, with no portion of the catalytic component being directly exposed to the combustion exhaust.

The parties dispute whether the term "intimately and entirely coated" means that the catalyst has absorber material disposed over it "sufficient to cover" the catalyst with a monolayer of absorber, or if the catalyst must actually be covered with at least a monolayer of absorber material. This limitation was added to claim 13 during the prosecution of the '758 Patent. In the amendment, EmeraChem explained:

The description of the absorber/catalyst material disclosed and claimed in incorporated U.S. Pat. No. 5,451,558 has been set out in the specification and Claim 13 has been limited by defining the catalyst/absorber by the terms as claimed in the copending and incorporated patent.

[Doc. 98-1 at 189]. An IPR was instituted as to the '558 Patent and the PTAB construed the term. Volkswagen argues that construction has collateral estoppel effect here and is also supported by the evidence intrinsic to the patent. EmeraChem does not dispute that the "intimately and entirely

coated” limitation in the ’558 Patent and the ’758 Patent should in theory be construed the same way, but argues that the Board’s construction was in error.

Collateral estoppel applies to the Board’s construction of the “intimately and entirely coated” term in the ’558 IPR because it was actually litigated and determined by a valid final judgment and the determination was essential to the judgment. Even if collateral estoppel does not apply, however, the Board’s reasoning is persuasive and supported by the intrinsic evidence. Based on the unambiguous language of claim 13 and Figures 1a-1c of the ’558 Patent, a person of ordinary skill in the art would construe the “intimately and entirely coated” term to mean that the catalytic component is coated with at least a monolayer of absorber material.

1. *Inter Partes* Review & Appeal

The Patent Trial and Appeal Board instituted an *inter partes* review as to numerous claims of the ’558 Patent, including claim 1, set forth below.

A material for removing gaseous pollutants from combustion exhaust comprising an oxidation catalyst specie selected from platinum, palladium, rhodium, cobalt, nickel, iron, copper, molybdenum or combinations thereof disposed on a high surface area support, said catalytic component *being intimately and entirely coated with an absorber* selected from a hydroxide, carbonate, bicarbonate or mixture thereof of an alkali or alkaline earth or mixtures thereof.

’558 Patent, col. 12:29-38. Relevant here, Volkswagen argued that claim 1 of ’558 is anticipated by Takeshima, Hoekstra U.S. Patent No. 3,849,343 (“Hoekstra”), and Kinoshita et al., U.S. Patent No. 4,369,132 (“Kinoshita”).

The Board first took up Volkswagen’s contention that certain claims of the ’558 patent are anticipated by Takeshima, including claim 1. [Doc. 98-1 at 254]. To establish anticipation, a party must show that each element of the claim in issue is found, either expressly or inherently, in a single prior art reference. *Finisar Corp. v. DirecTV Group, Inc.*, 523 F.3d 1323, 1334 (Fed. Cir. 2008). EmeraChem argued, *inter alia*, that Takeshima did not disclose an absorber *over* a platinum

group metal. [Doc. 98-1 at 259]. As the Board put it, Volkswagen's reply "suggests that Patent Owner's sole argument is that 'Takeshima does not . . . disclose an oxidation catalyst specie[s] intimately and entirely coated with an absorber.'" [Doc. 98-1 at 259].

EmeraChem added the "intimately and entirely coated" limitation to the patent during its prosecution. [*Id.*]. Thus, the language does not appear in the written description of the specification. However, based on Figures 1a, 1b, and 1c, the Board rejected Volkswagen's contention that the '558 patent did not "expressly state" that platinum must be coated with an oxide layer. [*Id.* at 260].

In the Petition, Volkswagen stated that "intimately and entirely coated" should be construed to require that the absorber material be disposed over, or on top of, the catalytic component relative to the high surface area support. [*Id.*]. Similarly, EmeraChem believed that the term should be construed to mean the amount of the absorber must be sufficient to form a monolayer on the surface area presented by the high surface area support. [*Id.*]. EmeraChem also agreed that "the combustion exhaust must nevertheless have access to the catalyst either directly or by diffusion through the overlaying absorber." [*Id.* (emphasis added)]

The PTAB reviewed the testimony presented by EmeraChem's expert, Dr. Crocker, and by Volkswagen's expert, Dr. Farrauto. [Doc. 98-1 at 258, 263-64]. The Board noted the difficulty in interpreting a term that does not appear in the written portion of the specification. It reasoned that on one hand, "a claim construction requiring that the absorber layer entirely cover the catalyst layer is entirely consistent with Figs. 1a-1c of the '558 patent and associated discussion in the specification." [Doc. 98-1 at 264]. "On the other hand, both experts seem to believe that 'intimately and entirely coated' is broader than Figs. 1a-1c." [*Id.*]. As the Board explained, both experts believed the claim language includes a situation where the catalyst has direct contact with the

exhaust gas, and is not limited to a monolayer absorbent where the catalyst functions through diffusion. [Id. at 264-65]. The Board then pointed to discussion at oral argument in which counsel for EmeraChem was unable to point to anything else in the specification that would require “intimately and entirely coated” to mean something other than what is depicted in Figure 1a of the patent. [Id. at 265].

The Board held:

We hold that “intimately and entirely coated” mean[s] exactly what it says. In other words, it means the embodiment shown in Figs. 1a through 1c of the ’558 patent drawings and associated discussion in the written description portion of the specification.

We appreciate why both parties would prefer a broader construction, i.e., “intimately and entirely coated” means (1) coated with a monolayer where catalytic action would occur through diffusion (our construction) *as well as* (2) direct contact with the combustion gas without diffusion. Petitioner would favor a broader construction because Takeshima anticipates a direct contact embodiment. Patent Owner would favor a broader construction because more “material” might infringe claim 1.

[Id. at 266]. Thus, based on Figs. 1a-1c, the Board found that “a *direct* contact embodiment does not fall within the scope of claim 1 of the ’558 patent.” [Id.]. Because Takeshima describes an embodiment where the exhaust gas directly contacts the catalyst, the Board held that Takeshima does not anticipate claim 1 of the ’558 patent. [Id.].

Considering the possibility of appeal, the Board also addressed anticipation under the parties’ broader construction, i.e., one that includes both exhaust gas in direct contact with the catalyst and through diffusion. “If it would turn out that ‘intimately and entirely coated’ covers [a direct contact embodiment], then Takeshima would anticipate claim 1 of the ’558 patent.” [Doc. 98-1 at 267].

The PTAB next analyzed Volkswagen’s contention that claim 1 and others are anticipated by Hoekstra. [Id. at 269]. EmeraChem argued, *inter alia*, that Hoekstra does not describe the

“intimately and entirely coated limitation.” [Id. at 272]. The Board disagreed and found that Hoekstra anticipates claim 1. [Doc. 98-1 at 281].

Similarly, EmeraChem argued that Kinoshita does not describe the “intimately and entirely coated” limitation. The Board found that Kinoshita did not explicitly describe a catalyst component, i.e. platinum, being intimately and entirely coated with an absorber. [Id. at 293]. Reviewing the expert testimony regarding Kinoshita, the Board noted concern that the subject example did “not describe enough detail to indicate whether there is enough potassium to cover the platinum-impregnated alumina.” [Id. at 295]. Accordingly, it found that Kinoshita did not describe the intimately and entirely coated limitation of claim 1, that the subject matter of claim 1 was not inherently described by Kinoshita, and therefore that claim 1 was not anticipated by Kinoshita. [Doc. 98-1 at 295].

The remaining grounds on which an IPR was instituted – Japanese Patent Application Publication No. H4-367724 (“Inui”), and Stiles – did not directly involve the “intimately and entirely coated” limitation. The Board found claim 1 was anticipated by both Inui and Stiles. [Doc. 98-1 at 304, 312]. Claim 1 and others were therefore found unpatentable. [Id. at 321-322].

EmeraChem requested a rehearing, arguing that it did not have the opportunity to address the Board’s construction of claim 1, that the findings were clearly erroneous, and that the Board misconstrued the claims and thus improperly found them unpatentable. [Doc. 98-1 at 328]. The Board denied the request, explaining that its decision relied on “the precise plain and ordinary meaning of the language of the claim, aided by the prosecution history, and the intrinsic evidence of the specification (including the figures).” [Id. at 332]. The Board explained that it had further relied on Dr. Crocker’s testimony that combustion exhaust could have access to the catalyst by diffusion through the overlaying absorber. [Id.].

EmeraChem appealed, arguing (i) that the Board’s construction of the “intimately and entirely coated” term was incorrect, and (ii) that the Board erred in finding various claims of ’558 were anticipated by Hoekstra, Inui, and Stiles. *EmeraChem Holdings, LLC v. Volkswagen Group of America, Inc.*, 714 F. App’x 995, 996 (Fed. Cir. 2017). EmeraChem urged a broader construction than that adopted by the Board, arguing that the “intimately and entirely coated” limitation does not require the absorber to form a continuous layer on top of the catalyst, but also encompasses a situation in which the exhaust gas directly contacts the catalyst through cracks or porous openings in the absorber coating. *Id.* at 997. But because EmeraChem’s construction was broader than that of the Board, the Federal circuit reasoned that it “would necessarily encompass materials that have a continuous layer *without* cracks or openings, which is what the Board’s construction requires.” *Id.* “In other words, a prior art reference that anticipates the ’558 patent under the Board’s construction would also anticipate under EmeraChem’s proposed construction.” *Id.*

Accordingly, the court declined to resolve whether the Board should have adopted a broader construction “because it would not affect the outcome of the IPR.” *Id.* The court held that the Board’s determination that Hoekstra, Inui, and Stiles each disclose an absorber that forms a continuous layer on top of the catalyst was supported by substantial evidence. *Id.* Thus, the Federal Circuit found that each of these prior art references would anticipate the ’558 patent claims even under EmeraChem’s broader proposed construction. *Id.*

In affirming the Board’s findings on anticipation, the court relied on the Board’s construction of the “intimately and entirely coating” limitation. *See id.* at 997-998. It rejected, for example, EmeraChem’s argument that Hoekstra does not teach a composite material with a continuous layer of oxidation catalyst: “That argument, however, is irrelevant because the ’558

patent claims do not require *the catalyst* to form a continuous monolayer. Instead, the claims only require the *absorber* to entirely coat the catalyst.” *Id.* Similarly, EmeraChem argued that Stiles did not provide a continuous layer of oxidation catalyst or absorber. The court disagreed, finding “Stiles expressly discloses embodiments in which the absorber ‘completely coats’ the catalyst,” and affirmed the Board’s finding of anticipation. *Id.* at 999. The Federal Circuit affirmed the Final Written Decision. *Id.*

2. Positions of the Parties

EmeraChem proposes that “intimately and entirely coated” means that an absorber material is disposed over the catalyst in a quantity at least sufficient to cover the catalyst with a monolayer. [Doc. 100 at 27]. First, EmeraChem argues that collateral estoppel does not apply because the Board adopted a claim construction that was in contradiction to the positions of the parties and their experts: “The entirety of the IPR record prior to the final decision agreed that ‘intimately and entirely coated’ allowed exhaust gas to directly access catalyst through openings in an absorber layer.” [Doc. 106 at 11]. EmeraChem argues that the Board again improperly relied on figures in the patent that do not necessarily depict reality, but are schematic depictions. [*Id.* at 12]. And EmeraChem notes that in the IPR, Defendants argued for a construction that would allow access to the platinum catalyst either directly or by diffusion through the absorber. [*Id.*]. EmeraChem urges that “the Court should not adopt a claim construction that neither party actually agrees to be a correct determination of what a claim term would mean to a person of ordinary skill in the art.” [*Id.* at 9].

In support of its proposed construction, EmeraChem offers the declaration of Dr. Bartholomew, describing the process of depositing absorber coating over the platinum/alumina catalyst and support. [Doc. 100 at 27]. The absorber particles “strongly wet the alumina surface,

leading to an ‘intimate and entire’ sorbent coating consistent with Claim 13.” [Id.] However, because the absorber coating consists of “large nanocrystals, its 2-D structure contains large pores which facilitate diffusion of NO_x molecules through the pores to the platinum/alumina.” [Id. at 28]. EmeraChem does not cite to any language in the patent to support its construction, nor does it explain why a “continuous monolayer” cannot be correct based on Dr. Bartholomew’s declaration. EmeraChem contends that the claim should not be construed to preclude direct exposure to the catalyst. [Id.].

Defendants argue the Board’s construction is binding on EmeraChem and that the intrinsic evidence supports the construction. [Doc. 111 at 18-23]. Volkswagen says EmeraChem argued its construction in the IPR, the Board rejected it, the Board rejected it a second time on rehearing, and the final written decision was affirmed on appeal, according its collateral estoppel effect. [Doc. 98 at 13-14]. Volkswagen says EmeraChem’s construction is “fatally flawed because it does not require a coating of absorber material actually be present, only that there is a sufficient amount of absorber material present so that the recited coating could possibly be formed.” [Id. at 14; Doc. 105 at 18-19]. According to Defendants, “EmeraChem lost its claim construction challenge on appeal because ‘under EmeraChem’s proposed construction,’ claim 1 would still be invalid.” [Doc. 111 at 20].

Volkswagen also argues the intrinsic evidence supports its current proposed construction, first because “being” intimately and entirely coated suggests that absorber is actually coating the catalytic component, rather than just present in sufficient amounts to form a monolayer. [Doc. 111 at 22]. Volkswagen also points to the figures in the patent, urging that they indicate a continuous monolayer. It notes that Plaintiff’s expert in the IPR, Dr. Crocker, testified that “in principle” the word “entirely” should mean there should not be any exposed platinum atoms. [Id. at 22].

3. Analysis

Volkswagen does not expressly explain how each element of collateral estoppel is met as to the Board’s construction of the “intimately and entirely coated” term, instead referring the Court to its analysis of the “platinum coating” term. [Doc. 111 at 21]. Generally, when an issue is (i) actually litigated and determined (ii) by a valid and final judgment, and (iii) the determination is essential to the judgment, the determination is conclusive in a subsequent action between the parties, whether on the same or a different claim. *B&B Hardware, Inc. v. Hargis Inds., Inc.*, 135 S. Ct. 1293, 1299-1300 (2015).

The Court finds that collateral estoppel applies to the Board’s construction and, even if it does not, the Board’s reasoning is persuasive.¹⁶ Though the Board construed the claim term in the ’558 IPR, the language was added to the ’758 patent to mirror that of ’558, which is, again, incorporated in its entirety into the ’758 patent. The construction was actually litigated by the parties in the IPR, on rehearing, and before the Federal Circuit. There is no dispute that the Board’s written decision was invalid or lacked finality.

EmeraChem’s opposition to collateral estoppel repeatedly conflates the standard for judicial estoppel and collateral estoppel. [See Doc. 106 at 10; Doc. 112 at 18]. EmeraChem argues that because it did not advocate the construction used by the Board, the issue was not “actually litigated.” [Doc. 112 at 17]. Because the Federal Circuit decided the appeal on other grounds, EmeraChem says it did not have a “full and fair opportunity” to litigate the issues, “so a second element of collateral estoppel is not present.” [Id. at 18]. Yet the construction of the same claim term was the subject of briefing in the ’558 Patent IPR and addressed in oral argument. [See Doc.

¹⁶ Due to this holding, the Court need not decide whether collateral estoppel also applies to the construction of the same term in the ’758 IPR.

98-1 at 260, 264-265]. The construction of this claim term was also the focal point of EmeraChem’s request for rehearing, which was briefed with the benefit of the Final Written Decision. [See *id.* at 328-332]. The proper construction of “intimately and entirely coated” was raised again on appeal. *EmeraChem Holdings, LLC v. Volkswagen Group of America, Inc.*, 714 F. App’x 995, 996-97 (Fed. Cir. 2017). EmeraChem had a full and fair opportunity to litigate the meaning of this claim term and in fact did so.

EmeraChem’s argument that Volkswagen took a contrary position in the IPR does not undercut the collateral estoppel analysis. [See Doc. 106 at 9]. And unlike judicial estoppel, collateral estoppel does not require that EmeraChem have advocated the position taken by the Board and lost. [See *id.* at 10].

Even if collateral estoppel does not bind EmeraChem to the Board’s claim construction, the Board’s reasoning is persuasive. The claim term does not appear anywhere else in the ’558 patent, just as it appears nowhere else in the ’758 patent. Neither party cites to any example or other discussion in the patent to which a person of ordinary skill in the art might turn to understand the claim. And while the significance of schematic drawings might be limited, there is no reason the Court cannot consider them. Here, the figures are wholly consistent with the plain language of the claim. Claim 13 discloses a catalytic component “being intimately and entirely coated” with absorber. The word “being” suggests the catalytic component is actually coated with absorber material, not that the absorber is sufficient to potentially cover the catalytic component. Likewise, the figures in the patent depict a continuous layer of absorber. See *Emerachem*, 714 F. App’x at 997 (“EmeraChem argues that the term ‘intimately and entirely coated’ does not require the absorber to form a continuous layer on top of the catalyst, *as depicted in the ’558 patent figures.*”

(emphasis added)). A person of ordinary skill in the art would read the claim in light of the entire patent, including Figures 1a to 1c.

While resort to extrinsic evidence is unnecessary, the Declaration of Dr. Bartholomew [Doc. 100-2] would not change the analysis. Using a representative loading from the '558 patent, Dr. Bartholomew explains that the sorbent is initially deposited as a solution, which “is more than sufficient to fully cover the layer of platinum on alumina catalyst.” [Id. at 11]. After the impregnation step, a drying step drives off the water, causing the volume and thickness of the solution to shrink. [Id.]. As it dries, large nanocrystals of the sorbent are formed at the alumina-sorbent interface, leaving a layer or multi-layer of 100 nm crystallites of sorbent. [Id.]. “Surface chemistry predicts that the oxide (e.g. BaO) or carbonate (e.g. BaCO₃ or potassium carbonate) interacts strongly with alumina (an oxide) at the interface, ensuring that the sorbent particles strongly wet the alumina surface, leading to an ‘intimate and entire’ sorbent coating consistent with Claim 13.” *Id.* at 11-12. The Declaration depicts this configuration:



Figure 2. Nanoscale model of monolithic NOx sorption system showing Pt/Al₂O₃ washcoat and BaCO₃ sorbent, consisting of large nanocrystals of about 100 nm in longitudinal diameter.

[Doc. 100-2 at 12]. Dr. Bartholomew further explains that “[s]ince the sorbent coating consists of large nanocrystals, its 2 D structure contains large pores which facilitate diffusion of NO molecules to the platinum/ alumina where NO is oxidized to NO₂ on Pt nanocrystals.” [Id.]. He concludes:

Claim 13 of the '758 patent requires the catalytic component (i.e., platinum on alumina) to be “intimately and entirely coated with an absorber material,” which is what is precisely described above and modeled in Figure 2, that is “an absorber

material disposed over the catalyst with a quantity of absorber material at least sufficient to cover the catalyst with a monolayer.”

[*Id.* at 13].

As Volkswagen notes, Dr. Bartholomew does not say that direct contact with the combustion gas is required by the methods, examples, figures, claims, or specification of the patent. [See Doc. 105 at 21]. He describes the process and its outcome more generally. Unlike the “platinum coating” term, the extrinsic evidence does not point to other details in the patent that would necessarily result in or require the construction advanced by EmeraChem. Further, the figures Dr. Bartholomew presents appear to depict a continuous monolayer of sorbent. [Doc. 105 at 18-19]. If his Declaration precludes the construction adopted by the Board, EmeraChem has failed to explain how and why.

That a continuous monolayer of absorber on catalyst is possible from the methods of the patent is further supported by testimony from the IPR. While Dr. Crocker and Dr. Farrauto apparently both believed that “intimately and entirely coated” requires access either directly or by diffusion to the platinum particles, Volkswagen points to portions of Dr. Crocker’s testimony that suggest the absorber would completely coat the catalytic component. [Doc. 98-2 at 45; Doc. 98-1 at 264]. Volkswagen clearly overstates his testimony as asserting that an embodiment in the ’558 patent “would indeed result in the Na_2CO_3 absorber material completely covering the platinum with a coating several monolayers in thickness.” [Doc. 111 at 23].¹⁷ In fact, Dr. Crocker repeatedly stated that he could not be sure without performing the requisite analyses, but that performing “a rough calculation, 10 weight percent sodium carbonate on an alumina of average surface area will probably produce a covering of a couple monolayers of thickness.” [Doc. 105-1 at 148] (emphasis

¹⁷ Similarly, in the IPR the Board noted: “Petitioner has ‘revised’ Dr. Crocker’s testimony to suit its case. Dr. Crocker did not testify that the claimed invention would be inoperable. He testified that . . . the effectiveness of the catalyst could be a function of the thickness of the absorber layer.” [Doc. 98-1 at 262].

added). He testified that he could not say “with certainty whether there are exposed platinum atoms or not.” [Id. at 148-50]. Nonetheless, he did testify that his understanding of the term “entirely” was that “the platinum particles are entirely coated and therefore that, in principle, there shouldn’t be any exposed platinum atoms.” [Id.]. He also explained that if he were designing a catalyst, he would try to restrict the thickness of the coating to not more than a couple of monolayers. [Id. at 150-51]. His testimony is thus consistent with the intrinsic evidence, indicating that the absorber is likely to coat the platinum atoms.

The Court construes “intimately and entirely coated with absorber” to mean “coated with at least a monolayer of absorber.” If construed to mean an absorber disposed over the catalyst in an amount “sufficient to form a monolayer,” parts of the catalyst could be exposed directly to combustion gas. The claim says “being intimately and entirely coated” and EmeraChem’s construction contradicts that claim language. The figures of the patent likewise depict at least a monolayer. In the absence of any intrinsic evidence that the claim requires the catalyst to have direct contact with the combustion gas, the Court agrees with the Board’s determination that the claim term means exactly what it says.

The Court rejects, however, Volkswagen’s addition of the phrase “with no portion of the catalytic component being directly exposed to the combustion exhaust” as unnecessary. It was not part of the Board’s construction in its Final Written Decision, so collateral estoppel does not apply. The “intimately and entirely coated” term is addressed to the coating of absorber on the catalyst; only by implication does it describe the interaction between the catalyst and any combustion exhaust. The claim term is fully construed without this addition. *Cf. ActiveVideo Networks, Inc. v. Verizon Commc’ns, Inc.*, 694 F.3d 1312, 1325 (Fed. Cir. 2012) (where proposed construction read

limitations into the claims, district court did not err in concluding terms had plain meanings that required no additional construction).

IV. THE '346 PATENT

The '346 Patent discloses methods and systems for reducing emissions of particulate matter from a gaseous stream. '346 Patent col. 1:43-44. EmeraChem asserts claims 41-47 and claim 49 of the '346 Patent against Volkswagen. All claim terms submitted for construction appear in independent claim 41, which recites as follows:

41. A system for reducing particulate matter in a gaseous stream, the system comprising:
a source of a gaseous stream comprising particulate matter;
a catalytic emissions trap comprising a catalyst, wherein the catalytic emissions trap is configured such that the gaseous stream contacts the catalyst as the gaseous stream flows through the catalytic emissions trap, wherein particulate matter in the gaseous stream is reduced by 30% or more; and
a particulate matter indicator for outputting a result to a user, wherein the result is the amount that particulate matter in the gaseous stream has been reduced.

'346 Patent, col. 23:52-63. The claim groupings herein are drawn from the parties' briefing.

An *inter partes* review was instituted as to various claims of the '346 Patent and the Board issued a Final Written Decision on January 22, 2016. [Doc. 100-14 at 2]. The Board found claims 1, 5, 6, 9, 10, 12, 16, and 39 unpatentable under 35 U.S.C. § 103. [*Id.* at 53-54]. Because the '346 Patent has not yet expired, the Board construed the terms proposed for construction under the "broadest reasonable interpretation" standard, rather than in accordance with the claims construction principles set forth in *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005). See, e.g., *Aqua Prods., Inc. v. Matal*, 872 F.3d 1290, 1298 (Fed. Cir. 2017) ("The Board reaches its conclusions based on a preponderance of the evidence, and in doing so, employs the broadest reasonable interpretation of the challenged claims for unexpired patents.").

A. Claim Grouping 1: “system” and “user”

Term	Claims	EmeraChem	Volkswagen
“system”	Claim 41	NO CONSTRUCTION NEEDED In the alternative, a regularly interacting or interdependent group of items forming a unified whole	A regularly interacting or interdependent group of items forming a unified whole.
“user”	Claim 41	NO CONSTRUCTION NEEDED In the alternative, someone using the system that includes a particulate matter indicator	Someone using the system that includes a particulate matter indicator.

Volkswagen argues that both of these terms must be construed “because their scope will be dispositive of at least one of EmeraChem’s three alternative theories of infringement for claim 41.” [Doc. 98 at 21]. EmeraChem contends that the terms need no construction, but if they do, Volkswagen’s construction is acceptable. Volkswagen does not argue that a person of skill in the art would construe the claim terms as it has proposed. It does not argue that the proposed constructions are necessitated or suggested by the claim, specification, prosecution history, or prior art. There is no contention that “system” or “user” have any meaning unique to this patent or the subject industry.

Volkswagen presents no argument specific to the construction of “user,” save its statement that “EmeraChem has identified multiple alternative entities . . . each of which may or may not be a ‘user’ depending on the term’s construction, along with differing infringement theories.” [Doc. 98 at 21]. But “[i]t is well settled that the role of a district court in construing claims is not to redefine claim recitations or to read limitations into the claims to obviate factual questions of infringement and validity but rather to give meaning to the limitations actually contained in the claims, informed by the written description, the prosecution history if in evidence, and any relevant extrinsic evidence.” *American Piledriving Equip., Inc. v. Geoquip, Inc.*, 637 F.3d 1324, 1331 (Fed. Cir. 2011).

As to the word “system,” Volkswagen argues that while the term appears in the claim preamble, it must be construed because “the preamble is ‘necessary to give life, meaning, and vitality’ to the claim.” *Pitney Bowes, Inc. v. Hewlett-Packard Co.*, 182 F.3d 1298, 1306 (Fed. Cir. 1999). In *Pitney-Bowes*, the term at issue was “generated shapes,” used first in the preamble and then in a concluding clause: “whereby the appearance of smoothed edges are given to the generated shapes.” *Id.* The Federal Circuit found that the term could only be understood in the context of the preamble statement.

The “system” term in claim 41 is different from that in *Pitney Bowes* first because it is a plain meaning, ordinary word and second because is not later used in claim 41. The court in *Pitney-Bowes* recognized this exact situation:

If, however, the body of the claim fully and intrinsically sets forth the complete invention, including all of its limitations, and the preamble offers no distinct definition of any of the claimed invention's limitations, but rather merely states, for example, *the purpose or intended use of the invention*, then the preamble is of no significance to claim construction because it cannot be said to constitute or explain a claim limitation.

Id. at 1305 (emphasis added). The claim 41 preamble does just that: it explains that the “system” is “for reducing particulate matter in a gaseous stream.” ’346 Patent, col. 23:52-54.

The Court finds that neither “system” nor “user” require construction. They are “commonly used terms; each is used in common parlance and has no special meaning in the art.” *Summit 6, LLC v. Samsung Elecs. Co., LTD*, 802 F.3d 1283, 1291 (Fed. Cir. 2015) (“Because the plain and ordinary meaning of the disputed claim language is clear, the district court did not err in declining to construe the claim term.”); *see also ActiveVideo Networks, Inc. v. Verizon Commc 'ns, Inc.*, 694 F.3d 1312 (Fed. Cir. 2012); *Finjan v. Secure Computing Corp.*, 626 F.3d 1197 (Fed. Cir. 2010). There is not an actual dispute regarding the scope of these claims such that construction is appropriate or required under Federal Circuit precedent. Moreover, Volkswagen has not pointed

to any intrinsic or extrinsic evidence to show that a person of ordinary skill in the art would read the claim according to its proposed constructions. *See O2 Micro. O2 Micro Int'l v. Beyond Innovation Tech. Co.*, 521 F.3d 1351, 1361 (Fed. Cir. 2008). In the absence of any evidence or argument regarding how a person of skill in the art would construe these terms, the Court finds they have their plain and ordinary meanings and declines to further construe them.

B. Claim Grouping 2: “particulate matter”

Term	Claims	EmeraChem	Volkswagen
“particulate matter”	Claim 41	Small particles of solid or liquid suspended in a gas and can occur in primary or secondary forms. Primary particulate matter is particles released directly into the atmosphere, such as hydrocarbons, smoke, dust, and the like. Secondary particulate matter, or particulate matter precursors, is emissions (such as NO _x , sulfur, ammonia, and the like) that react with other pollutants to form particulate matter.	Small particles of solid(s) having a diameter of 10 microns or less and/or liquid(s) suspended in a gas.

The ’346 Patent defines particulate matter as follows:

Particulate matter is small particles of solid or liquid suspended in a gas and *can occur in primary or secondary forms*. Primary particulate matter is particles released directly into the atmosphere, such as hydrocarbons, smoke, dust, and the like. *Secondary particulate matter, or particulate matter precursors*, is emissions (such as NO_x, sulfur, ammonia, and the like) that react with other pollutants to form particulate matter.

’346 Patent, col. 1:15-23 (emphasis added). “[A] definition set forth in the specification governs the meaning of the claims. When the specification explains and defines a term used in the claims, without ambiguity or incompleteness, there is no need to search further for the meaning of the term.” *Sinorgchem Co. v. Int'l Trade Comm'n*, 511 F.3d 1132, 1138 (Fed. Cir. 2007) (internal quotations and citations omitted). The ’346 patent clearly teaches that “particulate matter” can

exist in “primary or secondary forms.” The specification goes on to state that “secondary particulate matter” is also known as “particulate matter precursors.” The Court finds that the term “particulate matter” as used in the patent therefore includes both primary particulate matter *and* particulate matter precursors.

Volkswagen argues that such a construction conflicts with other portions of the specification or renders an additional claim, namely claim 44, superfluous. [Doc. 105, at 28-29]. But “particulate matter” includes two forms: “primary” and “secondary.” When claim 41 recites the inclusion of “particulate matter,” the definition provided in the specification means that this “particulate matter” can include either or both forms of particulate matter, primary or secondary. Claim 44, in contrast, claims “[t]he system of claim 41, wherein the particulate matter comprises particulate matter *and* particulate matter precursors.” Claim 44, then, is expressly claiming that secondary particulate matter, also known as particulate matter precursors, must be present, whereas in claim 41, particulate matter precursors are only one of two forms that could be present. For this same reason, the fact that the specification talks about the reduction or concentration of “particulate matter” separate from reduction of “particulate matter precursors” does not mean that “particulate matter precursors” are distinct from “particulate matter.” Rather, “particulate matter precursors” are a subtype within the larger classification.

Most importantly, Volkswagen cites to no support to show that a person of ordinary skill in the art would understand “particulate matter” to be separate and distinct from “particulate matter precursors,” contrary to the definition provided in the specification. Left only with the intrinsic evidence, the Court will construe “particulate matter” to include the sub-form “particulate matter precursors.” This also comports with other claims, such as claim 47, which states that particulate

matter comprises SO₂ and SO₃. Sulfur dioxide and sulfur trioxide are both particulate matter precursors identified by the '346 patent. Col 2: 18-21.

In its Final Written Decision in the '346 Patent IPR, the Board expressly declined to reach a decision on whether “particulate matter” included “particulate matter precursors.” [Doc. 100-14 at 24]. In fact, the closest the Board came to a construction is to note that claim 1 of the '346 patent covers “reducing ‘particulate matter’ (i.e., ‘small particles of solid or liquid suspended in a gas’).” [Id. at 25]. However, the Board offered no explanation for this definition and it does not overcome the language of the '346 patent itself. Accordingly, the Court construes “particulate matter” to mean small particles of solid or liquid suspended in a gas that can occur in primary or secondary forms.

C. Claim Grouping 3: “catalytic emissions trap”

Term	Claims	EmeraChem	Volkswagen
“catalytic emissions trap”	Claim 41	A device that includes a catalyst, <i>the catalyst for use in removing particulate matter from a gaseous stream</i> , ¹⁸ configured such that the gaseous stream contacts the catalyst as the gaseous stream flows through the trap.	A trap that includes a catalyst, the catalyst removing pollutants from a gaseous stream, in this case particulate matter, as the gaseous stream contacts the catalyst as the gaseous stream flows through the trap, with the removed particulate matter being chemically bound on and/or within the trap.

The parties dispute whether the “catalytic emissions trap” disclosed in claim 41 is limited to removal of particulate matter with the particulate matter being chemically bound within the trap. Claim 41 discloses “a catalytic emissions trap comprising a catalyst, wherein *the catalytic emissions trap* is configured such that the gaseous stream contacts the catalyst as the gaseous

¹⁸ In its response brief, EmeraChem revised its proposed construction to include the italicized language. [Doc. 106 at 23].

stream flows through the catalytic emissions trap, wherein particulate matter in the gaseous stream is reduced by 30% or more.” ’346 Patent, col. 23:54-60 (emphasis added). The specification further explains:

Embodiments also include systems that have a catalytic emissions trap. The emissions trap includes a catalyst and is configured such that the gaseous stream contacts the catalyst as the gaseous stream flows through the trap.

’346 Patent, col. 2:49-51.

According to EmeraChem, the patent sufficiently defines the catalytic emissions trap and should be construed in line with the patent language. [Doc. 100 at 32]. EmeraChem argues that Defendants’ attempt to limit the claim to cover only methods that involve traps where particulate matter is chemically bound on or within the trap is unsupported by the claim or specification. [*Id.*]. EmeraChem also notes that in the IPR, Volkswagen took the position that the “explicit definition” of a catalytic emissions trap in the ’346 Patent “is sufficient by itself” without further narrowing. [Doc. 100-10 at 10].

Initially, EmeraChem suggests Defendants are estopped from making an argument contrary to their position in the IPR, but fails to identify the theory of estoppel asserted or how its elements are met. [Doc. 100 at 32]. In the absence of developed argument demonstrating estoppel, Volkswagen is not estopped from advancing its construction.

Volkswagen’s principal argument is that the addition of the “chemically bound on and/or within the trap” requirement takes into account that all working examples of the catalytic emissions trap in the patent that satisfy the 30% reduction requirement of claim 41 are lean NO_x storage traps. [Doc. 105 at 29-30].¹⁹ Similarly, Volkswagen states that the lean NO_x storage trap disclosed in the

¹⁹ Volkswagen asserts, *inter alia*, that a lean NO_x trap catalytically removes pollutant by chemically binding the pollutant within the absorber material. [*Id.* at 30]. Volkswagen interprets the “overall reduction in ‘fine particulate matter’ reported in Tables 2-4 of the ’346 Patent” as being “almost solely attributable to the ability of the ‘catalytic emissions trap’ to remove the condensable inorganic fraction . . . from the exhaust stream, because the presence of the

'558 and '758 Patents chemically binds SO₃ within the absorber material through catalyzed reactions. [Id.].

Even if correct, Volkswagen's interpretation of the examples in the patent merely shows that its construction may be consistent with the examples. It does not show that the claim is limited by the examples. *See Phillips*, 415 F.3d at 1323 ("[A]lthough the specification often describes very specific embodiments of the invention, we have repeatedly warned against confining the claims to those embodiments."). Elsewhere, the patent states that the emissions trap of the subject systems "optionally include a sorber" and that the sorber (or absorber) "may facilitate retention of particulate matter and particulate matter precursors in the system." '346, col.17:19-23 (emphasis added). As Volkswagen concedes, there is at least one example in the patent that does not include an absorber (though it is not shown to have reduced particulate matter by 30% or more, as set forth in claim 41). [Doc. 111 at 31-32]. Volkswagen's citation to prior art is similarly unavailing, because even if prior art references disclose a catalytic emissions trap that chemically binds pollutants in the trap, that does not explain why claim 41 of the '346 Patent must also do so. Volkswagen's construction may be consistent with the specification and prior art, but neither can be used to import a limitation that has no basis in the claim itself.

Notably, Volkswagen makes no argument that a person of ordinary skill in the art would interpret claim 41 to require a trap that chemically binds removed particulate matter on or within the trap. And the Federal Circuit has advised that "[t]o avoid importing limitations from the specification into the claims, it is important to keep in mind that the purposes of the specification

'catalytic emissions trap' significant *increased* the emissions of the suspended PM and condensable inorganic fraction, for the most part." [Doc. 105 at 30]. Volkswagen offers no expert evidence to support its interpretation of the examples in the '346 Patent, citing only to the patent itself. EmeraChem makes similarly unsupported assertions, for example, that an oxidation reaction would not chemically bind hydrocarbon emissions. [Doc. 106 at 24]. These interpretations may be correct, but arguments of counsel are not an acceptable substitute for expert opinion testimony. These are not matters that would be known to a lay person nor are they obvious from the face of the patent. They are technical interpretations of data contained in the patent – the standard purview of expert opinion.

are to teach and enable those of skill in the art to make and use the invention and to provide a best mode for doing so.” *Id.*

Finally, Volkswagen’s argument that its construction gives meaning to the words “catalytic” and “trap,” whereas EmeraChem’s construction does not, is unpersuasive. [Doc. 98 at 23]. As revised, the parties’ constructions are quite similar other than the “chemically bound” restriction. And Volkswagen does not argue that the words “catalytic” or “trap” can only mean that particulate matter is chemically bound on or within the trap.

The Court adopts EmeraChem’s revised construction, which closely tracks the language of the claim and includes the “for use in removing particulate matter from a gaseous stream” language that aligns with Volkswagen’s proposed construction. Based on the clear language of claim 41, the Court construes a “catalytic emissions trap” to mean a device that includes a catalyst, the catalyst for use in removing particulate matter from a gaseous stream, configured such that the gaseous stream contacts the catalyst as the gaseous stream flows through the trap.

D. Claim Grouping 4: “a particulate matter indicator for outputting a result to a user, wherein the result is the amount that particulate matter in the gaseous stream has been reduced”

Term	Claims	EmeraChem	Volkswagen
“a particulate matter indicator for outputting a result to a user, wherein the result is the amount that particulate matter in the gaseous stream has been reduced”	Claim 41	Not means-plus-function	Means-plus-function limitation
“particulate matter indicator”	Claim 41	A device that reports to a user the amount of particulate matter in the gaseous stream. In some cases, particulate matter indicators report to a user that particulate matter has been reduced. The	The ’346 patent specification does not disclose any corresponding structure for the “particulate matter indicator”.

		particulate matter indicators may output a result to a user. The result may include the amount that particulate matter in the gaseous stream has been reduced.	
“outputting a result to a user”	Claim 41	NO CONSTRUCTION NEEDED In the alternative, deliver a result to a user	Receiving or determining a result and then displaying that result to the user.
“amount”	Claim 41	NO CONSTRUCTION NEEDED. In the alternative, a numerical amount (such as a weight or particle count) or a relative amount (as reported in a typical gas gauge in a typical automobile; not reporting a numerical amount of gallons left in a gas tank, but reporting a relative amount between empty, 1/4, 1/2, 3/4, and full), or a notification that particulate matter reduction has reached a predetermined level.	A discrete numerical value or a discrete relative value (such as a percentage value) that is representative of the amount that the particulate matter in the gaseous stream has been reduced.

1. Means-Plus-Function Analysis

The first step in analyzing a claim under § 112, ¶ 6 is to determine whether the claim limitation should be construed as a means-plus-function limitation. The Court finds that “a particulate matter indicator for outputting a result to a user, wherein the result is the amount that particulate matter in the gaseous stream has been reduced” should be construed as a means-plus-function limitation. 35 U.S.C. § 112 provides that a claim limitation may be written in a “means-plus-function” format. The statute provides:

An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

35 U.S.C. § 112, ¶ 6. If a claim term contains the word “means,” a presumption that the term is in means-plus-function format arises. *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1348 (Fed. Cir. 2015). If not, there is a presumption that the term is not a means-plus-function limitation. *Id.* “The standard is whether the words of the claim are understood by persons of ordinary skill in the art to have a sufficiently definite meaning as the name for the structure.” *Id.* at 1349. When a claim term does not use the word “means,” the presumption can be overcome and § 112, ¶ 6 will nonetheless apply “if the challenger demonstrates that the claim term fails to ‘recite sufficiently definite structure’ or else recites ‘function without reciting sufficient structure for performing that function.’” *Id.* (*quoting Watts v. XL Sys., Inc.*, 232 F.3d 877, 880 (Fed. Cir. 2000)).

The ’346 patent does not recite a sufficiently definite structure for “particulate matter indicator.” The specification spends very little time on the term. The specification discloses an embodiment that includes a “particulate matter indicator for outputting a result to a user, where the result is the amount that the particulate matter in the gaseous stream has been reduced.” ’346 Patent, col. 2:55-58. The specification further states that:

In certain embodiments, the subject systems also include a particulate matter indicator. Where desired, the particulate matter indicators reports [sic] to a user the amount of particulate matter in the gaseous stream. In some cases, particulate matter indicators report to a user that particulate matter has been reduced. The particulate matter indicators may output a result to a user. The result may include the amount that particulate matter in the gaseous stream has been reduced.

’346 Patent, col. 8:60-67. According to Volkswagen, this “describes, at best, only an aspirational functionality of outputting to a user an amount that particulate matter in the gaseous stream has been reduced, without any discussion of implementing structure.” [Doc. 105 at 33]. Volkswagen

further argues that the limitation recites a function (outputting a result to a user, wherein the amount that particulate matter in the gaseous stream has been reduced) without reciting sufficient structure for performing the function, because the specification does not disclose how the indicator generated or received the result it outputs. [Doc. 105 at 33].

“To determine whether the claim limitation at issue connotes sufficiently definite structure to a person of ordinary skill in the art, we look first to intrinsic evidence, and then, if necessary, to extrinsic evidence.” *Egenera, Inc. v. Cisco Sys., Inc.*, 972 F.3d 1367, 1373 (Fed. Cir. 2020) (quoting *TEK Glob., S.R.L. v. Sealant Sys. Int'l, Inc.*, 920 F.3d 777, 785 (Fed. Cir. 2019)). First, the Court does not agree with Volkswagen that EmeraChem’s use of the word “device” in its proposed construction requires mean-plus-function treatment of the “indicator” claim limitation. [Doc. 105, at 32]. The Court does agree that “particulate matter indicator” within the intrinsic evidence is a black box recitation of structure subject to application of § 112, ¶ 6, and that a person of ordinary skill in the art would not understand this term to recite a sufficiently definite structure. There is certainly no defined structure for the “indicator” provided in claim 41 itself. The specification offers no better, instead describing only various outputs that the indicator can report. There is also no discussion of how the “indicator” is connected to other components of the system claimed in claim 41, aside from the outputs it generates.²⁰ And since there is no sufficiently definite structure disclosed for *any* part of the “particulate matter indicator,” then the patent certainly does not recite how even a portion of such a structure would perform the functions performed by the “indicator” as claimed in claim 41.

Importantly, the Court does not view the teachings of the ’346 patent in a vacuum. Rather, it utilizes the intrinsic and extrinsic evidence related to the ’346 patent to determine how a person

²⁰ In IPR 2014-01557, the Board also noted that the ’346 patent “does not describe any particular indicator for receiving a report of the amount of particulate matter reduction.” [Doc. 100-14 at 28].

of ordinary skill in the art would define a claim term. A claim term may have sufficiently definite structure even if it “does not specifically evoke a particular structure.” *Personalized Media Commc’ns, LLC v. Int’l Trade Comm’n*, 161 F.3d 696, 705 (Fed. Cir. 1998). However, there is no evidence before the Court, intrinsic or extrinsic, that enables the Court to conclude that a person of ordinary skill in the art would understand the “particulate matter indicator” to recite a sufficiently definite structure or sufficient structure for performing the function of “outputting a result to a user.” There is no expert testimony or prior art before the Court showing that a structure for a “particulate matter indicator” was known to persons of ordinary skill in the art prior to the issuance of the ’346 patent. *See Mas-Hamilton Grp. v. LaGARD, Inc.*, 156 F.3d 1206, 1214 (Fed. Cir. 1998) (finding a claim limitation was a means-plus-function limitation where the patent owner failed to present evidence that the claim limitation had a well-known meaning in the relevant art). In fact, the Patent Office allowed claim 41 expressly because the prior art did not “teach or suggest the presence of the ‘particulate matter indicator’ set forth in claim 41.” [Doc. 98-3 at 256].

Even if the Court strips away the adjectival modifiers and focuses solely on the structure of “indicator,”²¹ the Court is unpersuaded by EmeraChem’s citation to case law in which the word “indicator” was found to be sufficiently definite to avoid the application of §112, ¶ 6. In *Aguayo v. Universal Instruments Corp.*, EmeraChem’s foremost citation, the district court found that a “location indicator” provided sufficient structure to avoid means-plus-function treatment. Civ. Act. No. H-02-1747, 2003 WL 25787593, *5 (S.D. Tex. June 9, 2003). In *Aguayo*, the district court relied on definitions from several technical dictionaries in concluding that the term “indicator” had a “well-known meaning to those skilled in the electrical arts.” *Aguayo*, 2003 WL

²¹ “An adjectival qualification placed on a term that otherwise sufficiently connotes structure does not reduce the sufficiency of the structure connotation for the purpose of section 112, ¶ 6.” *Aguayo*, 2003 WL 25787593 at *5 (quoting *Personalized Media Commc’ns, LLC v. Int’l Trade Comm’n*, 161 F.3d 696, 705 (Fed. Cir. 1998)).

25787593 at *4-*6 (“[T]he term ‘indicator’ does have a particular meaning connoting structure to those of skill in the electrical arts, defined in several electronics dictionaries, and is not merely ‘generic.’”).

The dictionary definitions in *Aguayo* were detailed and included examples, defining an “indicator” as:

- A “device or variable that can be set to a prescribed state based on the results of a process or the occurrence of a specified condition. For example, a flag or semaphore.”
- Any “device, such as a gauge, dial, register, or pointer, that measures or records, and visibly indicates a value, condition, etc.”
- “A device that gives a visual or other indication of a defined state.”
- A “(1) Meter. (2) Monitor. (3) Annunciator. (4) In a computer, a device that can be set by a specific condition, e.g., by a negative result or error indicator.”

Id. at 4.

The district court ultimately concluded that:

[T]he term “indicator” connotes structure, such as a gauge, dial, register, flag, meter, monitor, or annunciator. The fact that “indicator” does not define a particular structure does not invoke section 112, ¶ 6. The dictionary definitions of the term “indicator” convey a variety of structures known to those knowledgeable in the art.

Id. The “location indicator” at issue was also related within the claims to other claimed components; for instance, the “location indicator” was “responsive” to a component identifier. *Id.* at *6.

Importantly, the *Aguayo* case pre-dates *Williamson v. Citrix Online, LLC*, 792 F.3d 1339 (Fed. Cir. 2015). Here, EmeraChem cites a definition from the Oxford Dictionary of English as extrinsic evidence of the structure of “indicator”: a device providing specific information on the state or condition of something. [Doc. 106 at 25; Doc. 100-11 at 3]. Post-*Williamson*, “[t]he

question is not whether a claim term recites *any* structure but whether it recites *sufficient* structure – a claim term is subject to § 112(f) if it recites ‘function without reciting sufficient structure for performing that function.’” *Egenera, Inc. v. Cisco Sys., Inc.*, 972 F.3d 1367, 1374 (citing *Williamson*, 792 F.3d at 1348) (emphasis in original). Even assuming that the Oxford Dictionary definition provides extrinsic evidence of a structure for an “indicator” known to a person of ordinary skill in the art, the definition still does not explain how the “indicator” provides sufficient structure specifically for “outputting a result to a user, wherein the result is the amount that particulate matter in the gaseous stream has been reduced.”

The claims and specification reference the output of the “particulate matter indicator,” but they also do not provide any structural limitation to the inputs, connections, or operation of the claimed “indicator for outputting a result to a user.” To report the result, which is “the amount that the particulate matter in the gaseous stream has been reduced,” the “particle matter indicator” must first either determine or receive the amount to output. However, unlike *Aguayo* where the source of the information being displayed by the indicator was known (the “location indicator” was “responsive” to a component identifier), here the “indicator” is a component floating in space, untethered to the other components of the system of claim 41. This supports the conclusion that this is means-plus-function limitation. See *Egenera*, 972 F.3d at 1374-75 (“[H]ere the claims and specification provide no structural limitation to the ‘inputs, outputs, connections, and operation’ of the claimed ‘logic to modify.’”). EmeraChem’s additional citations in its responsive briefing [Doc. 106, at 26] are unpersuasive.²² Accordingly, under *Williamson*, the Court finds this claim limitation to be a means-plus-function claim limitation subject to the application of § 112, ¶ 6.

²² In *Hewlett-Packard Co. v. EMC Corp.*, 2004 U.S. Dist. LEXIS 28460, at *107-109 (N.D. Cal. June 23, 2004), the Court was *not* determining whether “indicator” provided sufficient structure to avoid the application of § 112, ¶ 6, because the claim was not expressed in a means-plus-function format. The same is true for *Medtronic Minimed, Inc. v. Smiths Med. MC, Inc.*, No. 03-776-KAJ, 2005 U.S. Dist. LEXIS 10583, at *73-*76 (D. Del. June 1, 2005), *Lutron*

2. “Indicator”

Having determined that the “indicator” limitation must be construed as a means-plus-function limitation, the Court must construe the limitation.

Construing a means-plus-function claim term is a two-step process. The court must first identify the claimed function. Then, the court must determine what structure, if any, disclosed in the specification corresponds to the claimed function.... If the patentee fails to disclose adequate corresponding structure, the claim is indefinite.

Williamson, 792 F.3d at 1351-52 (citations omitted).

The function performed by the particulate matter indicator in claim 41 is “outputting a result to a user, wherein the result is the amount that particulate matter in the gaseous stream has been reduced.” ’346 Patent, col. 23:61-63. Again, *Williamson* is instructive:

Structure disclosed in the specification qualifies as ‘corresponding structure’ if the intrinsic evidence clearly links or associates that structure to the function recited in the claim. Even if the specification discloses corresponding structure, the disclosure must be of ‘adequate’ corresponding structure to achieve the claimed function. Under 35 U.S.C. § 112, paras. 2 and 6, therefore, if a person of ordinary skill in the art would be unable to recognize the structure in the specification and associate it with the corresponding function in the claim, a means-plus-function clause is indefinite.

Williamson, 792 F.3d at 1352.

The corresponding structure is the “particulate matter indicator” as identified in the ’346 Patent, col. 8:60-67. The scope of coverage of a means-plus-function claim limitation is restricted to only the structure, materials, or acts described in the specification *as corresponding to the claimed function and equivalents thereof*. *Williamson*, at 1347 (citing *Northrop Grumman Corp. v. Intel Corp.*, 325 F.3d 1346, 1350 (Fed. Cir. 2003)) (emphasis added). Therefore, the Court construes the structure described by the term “particulate matter indicator” as the structure performing the functions described in the specification that correspond to the language of claim

Elecs. Co. v. Control4Corp., No. 2:06-cv-401, 2009 U.S. Dist. LEXIS 3562, at *18-*21 (D. Utah Jan. 20, 2009); and *AT&T Corp. v. Excel Comm’ns., Inc.*, No. 96-434, 1999 U.S. Dist. LEXIS 17871, at *37 (D. Del. Oct. 25, 1999).

41, namely “output[ting] a result to a user” where the result is “the amount that the particulate matter in the gaseous steam has been reduced.” Patent ’346, col. 8:65-67.

3. “Outputting a result to a user”

The parties also dispute the construction of the functional language “outputting a result to a user” and “amount.” First, EmeraChem argues that “outputting” is a plain English, non-technical term that does not require construction. [Doc. 100 at 34-35]. Volkswagen proposes that the claim term “outputting a result to a user” should be construed to mean “receiving or determining a result and then displaying that result to the user.” [Doc. 98 at 26]. EmeraChem contends that there is no basis for adding the “receiving or determining a result” language, and the Court is inclined to agree. [Doc. 106 at 26-27]. Volkswagen’s construction imports a “receiving or determining” functionality to the particulate matter indicator that is not disclosed within the patent itself. In fact, Volkswagen pointed out that there is no disclosure of this functionality or a structure for performing this functionality when arguing that the entire claim limitation at issue deserved means-plus-function treatment. [Doc. 111 at 36]. Volkswagen has not presented any additional evidence that a person of ordinary skill in the art would understand “outputting” to include “receiving or determining.” “Output” is a common word, and it appears to be employed here in its common usage, without any technical or specialized meaning. For these reasons, the Court declines to construe “outputting a result to a user.”

4. “Amount”

Next, the parties dispute the construction of the functional language “amount,” in the larger phrase “wherein the result is the amount that particulate matter in the gaseous stream has been reduced.” The ’346 Patent includes the following discussion relevant to reporting results:

In addition, the methods include reporting that particulate matter in the gaseous stream has been reduced. In certain instances, *the reporting includes providing an*

indication, such as an audio and/or visual signal, to a user *that particulate matter in the gaseous stream has been reduced*. The reporting may include displaying that particulate matter in the gaseous stream has been reduced. In some cases *the amount of particulate matter* in the gaseous stream is displayed. Where desired, the amount of *the reduction of particulate matter* in the gaseous stream may be displayed.

...

In certain embodiments, the subject systems also include a particulate matter indicator. Where desired, the particulate matter indicators reports to a user the amount of particulate matter in the gaseous stream. In some cases, particulate matter indicators report to a user *that particulate matter has been reduced*. The particulate matter indicators may output a result to a user. The result may include *the amount that particulate matter in the gaseous stream has been reduced*.

'346 Patent, col. 4:26-35, col. 8:60-67 (emphasis added).

In the '346 Patent IPR proceedings, the Board read these sections as follows:

In our view, the “[i]n some cases, particulate matter *indicators report* to a user that particulate matter has been *reduced*” is the claim 1 embodiment “reporting that particulate matter has been reduced.” “The result may include the *amount* that particulate matter in the gaseous stream has been reduced” embodiment is the claim 41 “the result is the amount that particulate matter . . . has been reduced.”

[Doc. 100-14 at 27-28]. The Board reasoned that “[t]he claim 41 embodiment requires something more than a report that particulate matter has been reduced; it requires reporting an amount of reduction.” [Id. at 28]. It concluded that “amount” “means the indicator must report a numerical amount or a relative amount (as reported in a typical gas gauge in a typical automobile; not reporting a numerical amount of gallons left in a gas tank, but reporting a relative amount between empty, ¼, ½, ¾ and full).” [Id. at 30]. The Board noted that both parties sought a broader construction of the term. [Id. at 31]. It also stated that its construction would be the same whether under the broadest reasonable interpretation standard or under the *Phillips* standard applicable here. [Id. at 30].

Here, EmeraChem says “amount” is a plain English, non-technical term that does not require construction. [Doc. 100 at 36-37]. In the event the Court determines construction is

necessary, EmeraChem proposes that “amount” means the indicator must report a numerical amount or relative amount, including a notification that particulate matter reduction has reached a predetermined level. [Id.]. Volkswagen seeks a construction that “the indicator must display a discrete numerical value or a discrete relative value (such as a percentage value) that is representative of the amount that the particulate matter in the gaseous stream has been reduced.” [Doc. 105 at 34-35]. As the term “amount” is susceptible to more than one meaning, construction is necessary.

Initially, EmeraChem suggests that Volkswagen is estopped from advancing its proposed construction because it is contrary to the position Volkswagen took in the *inter partes* review of the ’346 patent. [Doc. 100 at 36]. In the IPR, Volkswagen asserted that “[t]he ’346 patent specification does not limit the format in which the amount of reduction in particulate matter must be reported to the user.” [Doc. 100-13 at 22]. Volkswagen argued that the broadest reasonable construction “would encompass any form of notification to the user that the reduction in particulate matter has reached a predetermined level.” [Id. at 23]. Because the Board did not adopt either party’s proposed construction, Volkswagen is not estopped from taking a different position here. [Id. at 29-30]; *Skyhawke*, 828 F.3d at 1376 (“SkyHawke clearly did not advocate the claim construction ultimately adopted by the Board.”). Moreover, EmeraChem fails to specify a theory of estoppel or present argument showing how the relevant elements are satisfied.

The Court agrees with and adopts the Board’s construction. Claim 1 discloses “reporting that particulate matter has been reduced.” Claim 41 discloses a particulate matter indicator that outputs a result to a user, “wherein the result is the amount that particulate matter . . . has been reduced.” The apparent distinction is that claim 1 contemplates only a report of a reduction, whereas claim 41 requires the result to include the amount that particulate matter has been reduced.

As Volkswagen argues and the Board held, claim 1 reads on the functionality, “In some cases, particulate matter indicators report to a user *that particulate matter has been reduced.*” [Doc. 100-14 at 27-28]. Meanwhile, claim 41 reads on the functionality, “The result may include *the amount that particulate matter in the gaseous stream has been reduced.*” The Board’s construction of “amount” in claim 41 gives effect to the different language in these claims.

EmeraChem would add to the Board’s construction a result that includes “a notification that particulate matter reduction has reached a predetermined level.” [Doc. 98 at 26]. This addition largely obviates the above-noted distinction between the language of claim 1 and claim 41. It also simply makes less sense of the language of the claim. Reporting that a predetermined level of reduction has been reached is not the same as reporting the amount itself, in this case the amount “that” or by which the particulate matter has been reduced. Practically speaking, EmeraChem’s construction would seem to require a user to know what the “predetermined level” is in order to understand the notification. The user would have to already know the “amount” in order to understand a notification that did not consist of an amount. But the claim says that the result output by the particulate matter indicator “is the amount” that particulate matter has been reduced. It does not say that the result is a notification that reflects an amount.

EmeraChem’s effort to differentiate between claim 1 and claim 41 based on its own construction is also unpersuasive. [Doc. 112 at 30-31]. EmeraChem urges that claim 1 would allow a “yes/no” indication, while claim 41 “requires an amount of reduction, which could [be] a numerical amount, a relative amount or a predetermined amount.” [Id. at 31]. EmeraChem does not explain how a notification that particulate matter has reached a predetermined amount such as a 30% reduction can be meaningfully different from both (i) a “yes/no” indication, and (ii) a relative amount.

EmeraChem is correct, however, that Volkswagen has advanced little argument in support of its own construction, which would require a “discrete” numerical or relative value. Volkswagen urges that the amount must be a “discrete” numerical or relative value “as opposed to a range of values, such as 70% or more.” [Doc. 111 at 37]. But this appears to conflict with the Board’s construction that “amount” includes a relative value, such as a typical gas gauge that reports “between empty, $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, and full.” And Volkswagen does not suggest that the Board’s construction is deficient in this regard. To the contrary, Volkswagen says that its own definition “comports with the Board’s construction,” which is “persuasive and entitled to deference.” [Id.]. More practically speaking, the inclusion of the word “discrete” is more likely to confuse than aid the jury.

Based on the plain language of claim 41, viewed in light of the specification and independent claim 1, the Court finds that a person of skill in the art would construe “amount” to mean a numerical amount or a relative amount (as reported by a typical gas gauge in a typical automobile, i.e., not reporting a numerical amount of gallons left in a gas tank, but reporting a relative amount between empty, $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$ and full).

V. AGREED CONSTRUCTIONS

Term	Patent	Claim	
“inert carrier gas”	’758	Claims 1 & 13	The regenerating gas has an oxygen content of no more than one percent oxygen.
“nitrogen oxides”	’758	Claims 1 & 13	Molecules consisting of an electrically neutral group of only one or more nitrogen atoms and one or more oxygen atoms, including nitric oxide (NO) and nitrogen dioxide (NO ₂).
“particulate matter precursors”	’346	Claim 41	Emissions that react with other pollutants to form particulate matter.

The Court adopts the parties’ agreed constructions.

VI. CONCLUSION

For the reasons stated, the Court adopts the claim constructions outlined herein.

SO ORDERED.

/s/ Charles E. Atchley, Jr. _____

CHARLES E. ATCHLEY, JR.

UNITED STATES DISTRICT JUDGE